THE

DENTAL COSMOS:

A

MONTHLY RECORD OF DENTAL SCIENCE.

Devoted to the Interests of the Profession.

EDITED BY

JAMES W. WHITE, M.D., D.D.S.

Observe, Compare, Reflect, Record.

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Dentist

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ORIGINAL COMMUNICATIONS.

FUNCTION: ITS EVOLUTION, AND INFLUENCE ON ORGANIZATION.

BY C. N. PEIRCE, D.D.S., PHILADELPHIA, PA.

(Read before the New York Odontological Society, November 10, 1885.)

Mr. President and Gentlemen: Through the courtesy of your executive committee I have the pleasure of meeting you this evening. The subject of my remarks, with their consent, I have termed "Function: Its Evolution, and Influence on Organization."

To this title I should not be surprised if I heard three inquiries. First, why select a subject so hacknied and common-place? Second, why select one upon which there are such differences of opinion, and upon which we can have no united or harmonious expression? Third, why select a subject so foreign to our profession as a specialty? To the latter inquiry let me answer that, if I do justice to my title, I trust all will be able to see its intimate and important relation to at least a branch of our industry; and to the first and second let me say that hacknied or common-place subjects always contain germs of valuable truths, while varied and conflicting thoughts sharpen the wits and add to the understanding.

It has been my good or ill fortune within the last few months, to have earned some kindly criticism from several of my professional brethren, and when invited to meet you this evening it was a happy suggestion from a friend or two that induced me to endeavor to elaborate the views previously expressed, and sustain them, if possible, by some further illustrations.

I have stated, as published in the September number of the Dental Cosmos, that teeth are, like other tissues, developed in correspondence with natural and mechanical forces; that their health or normality, their morphology, structural arrangement, density, size, and location are all alike subservient to their function and nutrition, and that these are important factors in their preservation.

Whim, accident, or design should not and cannot be recognized as factors in tooth-evolution or formation, but in this phenomenon we must first place jaw-movements and the mechanical forces necessarily accompanying these mandibular excursions in the trituration of food; second, the restriction and limitation of diet in its variety, and the differences in the degree of resistance to be overcome in its mastication; and, third, the cumulative force which is utilized through that most wonderful factor and important evolutionary function, heredity. These thoughts I do not express in any desire for controversy, but as an honest conviction, believing that in their recognition we shall have a more correct understanding of many both physiological and pathological conditions which we are daily called upon to study and treat. In what follows I shall endeavor to illustrate that this force, which is so potent in tooth-evolution, exerts a similar influence in the evolution and modification of all other structures and organs.

Whether we invade the precincts of the horticulturists, arboriculturists, anatomists, physiologist, or biologist, each and all must bear testimony to these same originating and modifying influences, and recognize the fact that heredity, adaptation, and growth, being of especial importance in the evolution of the organic body, must, therefore, be regarded as especially formative functions. The chief modifications of the organs of animals and plants, says Lamarck, result from functions or actions of the organs themselves; from the exercise or the absence of exercise, the use or disuse of these organs. As an example of this we have the peculiarly long tongue of the moth-butterfly, and the tongues and beaks of the humming-bird and woodpecker, so developed in taking their food from deep flowers or crevices. In this connection we may also mention the long neck of the ostrich, and the very rudimentary gizzard of the sea-gull, which, when John Hunter fed the animal on corn or other grain, developed into a complete and perfect organ. In the same way we may have by change of food a change in the jaws and teeth, and as a consequent or concomitant variation an entire change in the formation of the head and face.

In speaking of the evolution of function, we cannot isolate it from the evolution of organs, so nearly do they develop together by the process of adaptation. Adaptation to environment might, indeed, be said to be the ancestor of function; function, however, taking the lead of organization. Our first inquiry being in reference to the evolution of function, I must reiterate the statement just made that the evolution of organs or of bodily form is so inseparably connected with the evolution of function that it is impossible to discuss one without the other. Prof. Haeckel says, "The peculiar form of the

organism and its organs, both internal and external, is always closely related to the peculiar manifestations of life, or, in other words, to the physiological functions performed by these. * * * The history of the evolution of forms is at the same time the history of the evolution of functions. * * * Morphology, the science of forms, aims at a scientific understanding of organic structures, of their internal and external proportions of form." Physiology, the science of function, on the other hand, aims at a knowledge of the functions of organs, or, in other words, of the manifestations of life, but it has done little or nothing on the evolution of functions. For what has been done in this direction we are indebted to the labors of the morphologist.

Fallopius, in the sixteenth century, declared that "life is not the effect or result of organization, but that organization is one of the phenomena presented by living matter." Wolff, in 1759, announced the same principle in saying, "The vital forces are molecular forces,—that is, not dependent upon organs, but on the materials of which organs are composed (protoplasm)." Huxley, in 1869, in his famous Edinburgh address on "The Physical Basis of Life," reiterated and amplified the doctrine of Fallopius and Wolff,—a doctrine which is now generally accepted by biologists. Prof. Francis Emily White says, "The phenomena of living matter are its functions, among which the power of development and differentiation into specialized forms and definite organs with their special and definite functions is conspicuous." Von Baer's law of development has a similar significance: "The more special forms of structure arise out of the more general, and that by a gradual change." These gradual changes being brought about by the different uses to which general forms have been subjected, ever varying external conditions, with functions increasing in certain definite directions, result in the increasing specialization of form, illustrating, as Prof. White says, that "the price of existence is adaptation to environment." The scales of fishes, the feathers of birds, the hairs of mammals, the teeth and nails and claws of many animals, all originate in the papilla of the epiderm. These various special structures arise out of the general one, under the impulse and influence of the different uses to which the epiderm has been subjected by differences in the environment, and the process of adaptation to that environment.

The very definition of life given by Herbert Spencer, "the continuous adjustment of internal relations to external relations," or as Prof. White puts it, "the continuous reactions of organized matter in response to incident forces," implies that function takes the lead, development and growth resulting therefrom and making still further and more complex reactions possible.

That function takes precedence of structure, seems implied in this

definition of life. If life consists of inner actions so adjusted as to balance outer actions, then may we not say that this continuous change, which is the basis of function, must come before the structure which brings function into shape. Now, since throughout all phases of life, from the lowest to the highest, "every advance is the effecting of some better adjustment of inner to outer actions, and since the accompanying new complexity of structure is simply a means of making possible this better adjustment, it follows that function is from beginning to end the determining cause of structure."

The powerful limbs of the heavy draught horse, the delicate structure of the racer, the architectural and other instincts of the bee, the serrated teeth of the ravenous shark, the succession of poison fangs of venomous reptiles, as well as their marvelous structural arrangement, are all living evidences of this influence of function on organization. Examples within the life experience of a single individual may be more convincing, and as much as some minds can grasp. For such we refer to the suckling of an infant by its Indian father as a result of continued efforts on the part of the child to gratify its natural instinct. With the development of the function of secretion by the rudimentary mammary glands of the father, there was of course a corresponding growth and development of the glands themselves, which are inherited in a rudimentary form by males as well as females, and derived originally from the common glands of the skin by a similar process, as in the Indian father,—that is, by use. A second well-recognized example is that of the man born without arms, who through years of experience learned to paint and do many other things with his toes, which, as a result of continued use and manipulation in accomplishing his artistic work, rather than for support and locomotion, grew longer and more like fingers. The hands and feet of apes, being used for similar purposes, are much alike, while those of the normal man, which are put to different uses, are wholly different. But this man under the stress of necessity converted his feet into hands by requiring them to subserve the function of hands. Again, we may mention the well-known fact of the larva of a working-bee being developed into a queen-bee by change of food; and the ovum of a tape-worm getting into the intestines of one animal unfolds into the form of its parent, but if carried into other parts of the system, or into the intestines of some unlike animal, it becomes a creature so entirely different from the tape-worm that only after careful investigation has it been shown to have the same origin. Still another illustration may be found in the hydra, which may be turned inside out, and what was the dermal surface soon becomes the alimentary tract, performing the function of that organ.

In estimating the evolution of intelligence, not less marked is the influence of function upon the cerebrum and cerebellum. In the lowest vertebrate animal these organs do not exist, while in fishes they are found in almost a rudimentary form; in birds and lower mammals they grow more conspicuous, and with the increased function of intelligence the cerebrum covers up the cerebellum and extends forward, increasing not only in size but in furrows and convolutions, until the demands of a great scholar or logician have reached their limitations. That the growth of brain and its convolutions have taken place in response to the demands of function is as well attested as the development of the blacksmith's muscle in response to his forging. That dogs, horses, and monkeys, in common with children, are teachable, demonstrates the influence of function over structure. Our schools, colleges, and churches are all established in recognition of this fact; while specialization in structure in response to specialization in education and function demonstrates it beyond the shadow of doubt. Illustrations of the modification of structure in response to function crowd upon us without limit, and at the risk of being tedious I must refer you to the beak of a shoveller-duck, the baleen plates in the mouth of the Balænoidea or Greenland whale, and the eyes on the upper side of the head of the flat-fish, while in the young they stand opposite to each other. These and modifications of structure in many other animals during life, which might be mentioned, all attest the law of adaptation and the response to the influence of function. The horticulturist will tell you he cannot furnish you good vegetables if the nourishment is diverted to seed-bearing (a cabbage yielding seed will not head). The arboriculturist, to be successful in transplanting trees, needs to place the same side to the north, or there is loss of growth and strength in the adaptation to the new environment. In cultivating grapes from cuttings, canes with two or three leaf or fruit buds on them, taken from the parent vine and placed in the ground with one bud subjected to the influence of the air and the other in the earth, while the latter produces roots for the absorption of moisture and nourishment, the former develops into leaves for the appropriation of gases from the atmosphere. Both are equal illustrations of adaptation to environment in response to function. This same statement is true regarding the willow and many other both large and small plants. Before leaving these evidences of the influence of function we must say something of the support or encouragement this idea derives from *atavism* or degeneration—retrogression and reversion, if you please. Not only progressive but also retrograde modifications take place in this effort at adaptation and specialization in response to the influence of function. During the progressive evolution of higher organisms there is frequently a

retrograde process of evolution in individual parts, illustrated in the absorption of the roots of deciduous teeth, and of numerous other organs which have become rudimentary in consequence of having become useless to the organism. This is true of the human family as well as of other species.

Organs becoming valueless for life purposes have their nutritive currents diverted, and hence suffer consequent reduction in size. For examples of this we may mention the muscles of the ear, the remnant of a third inner eyelid, the so-called nictitating membrane; also, the vermiform appendage to the cæcum, all of great physiological importance to some other animal, but in man perfectly useless; hence diversion of the nutrition to some other and more necessary and active part. The fact that nearly all more highly-developed organisms possess such rudimentary organs tells strongly against the doctrine of design, and speaks volumes for modification through or by adaptation where there has been a change in function.

Where animals have become adapted to new conditions of life, not by the acquisition of new or additional specializations of structure, but by the loss of old ones, gives us a very good illustration of modified structure from modified function. In what are termed cases of simplification or degeneration, such as result in newly-established parasites, gives us instances of the tendency to vary and change, and the influence of environments or surroundings. In the *Popular Science Monthly* for June, 1881, Dr. Andrew Wilson says, "When an animal or plant attaches itself partly or wholly to another living being, and becomes more or less dependent upon the latter for support and nourishment, it exhibits, as a rule, retrogression and degeneration. The parasitic 'guest,' dependent on its 'host' for both board and lodging, is in a fair way to become degraded in structure, and, as a rule, exhibits degeneration of a marked kind, where the association has persisted sufficiently long." A digestive system and organs of sense are not necessary for an attached animal living upon its host. So animals possessing powers of locomotion and all the organs necessary to an independent life, when assuming this new condition, "lose their eyes, legs, digestive system, and all the ordinary belongings of animal life, as a natural result of participating in what has been well named the vicious cycle of parasitism."

We have thus far spoken of modification in organs in response to change of function, and have endeavored to give illustrations showing that integrity of structure in their respective organs is well maintained by the fulfillment of function to its normal extent, and that within certain limits the increase of function is followed by such structural changes in their respective organs as enables the organs to better discharge their extra functions, and also that in

succeeding generations these specialized organs may be made continually more marked by this altered function. We have also given illustrations of the reverse condition,—that is, when from any cause there is the absence or waning of function. Then structures lose their integrity, and organs become atrophied or entirely disappear. A pertinent inquiry must here be suggested to your minds, *i. e.*, How far may this transformation, modification, or aggregation proceed in an individual? The answer is, the limitation must be subservient to the congenital structure, which limits the possibilities of each organ or organism.

Our next query will be regarding the nutritive currents which result in these modified structures and organs. What changes, near or remote, take place in them? We all recognize that excess of waste under normal conditions is followed by excess of repair; but this, you see, would be only to an equivalent extent. That the organ shall be augmented in size, we must have a continued increase of function, and this is necessarily followed by increased nutrition and growth; and this, as Herbert Spencer says, "implies additional work given to the branch arteries which bring the blood, and additional work, smaller in proportion, to the arteries from which these branch arteries come." These changes, you see, necessitate a corresponding change in the smaller and larger veins which take away the blood, as well as in the absorbents which carry off the effete products. Upon the nerve-centers which excite the muscle must also fall increased labor. Before the vessel which supplies the needs of a hard-worked muscle can permanently perform this additional duty, it must increase in diameter and contractile power, and that this may be sustained in its newly-assumed duties, the larger or more important one from which it diverges must also be so far modified as to meet and supply this increased demand for blood from the branch artery.

Gentlemen, let me here digress a little, and make an application of these physiological conditions, and in doing so direct your attention to one of the most serious pathological results which we are called upon to remedy or modify. The normal condition of tooth-structure in response to function, at a certain adult period, is indurated or increased density. This requires an additional amount of blood to carry the required lime-salts to the pulp. As calcification progresses, resulting in partial or complete dentification of this organ, the vessels conveying this nutritive fluid are all more or less stimulated and proportionately enlarged by this increased function. As the tooth or its pulp becomes permanently solidified, the excess of lime-salts, which previously found place in hardening this organic tissue, now finds lodgment as an amorphous salt or

additional cement on the exterior of the root, and becomes a source of irritation; so that processes which were consistent with, and had their origin in, physiological actions, by increased function and diverted nutrition may under certain systematic conditions terminate with pathological results.

From preceding statements and illustrations recited to sustain them, I think I have shown the correctness of what I said in the beginning,—that is, that the teeth in their development, like other tissues, are dependent upon their function and their inheritance for their *health*, their morphology, their structural arrangement, their density, their size, and their location. In the exercise of this function we place as of first importance in producing results jaw-movements, and the mechanical force necessarily accompanying these mandibular excursions in the trituration of food; second, the restriction or limitation of food in its variety, and the differences in the degree of resistance it offers in its comminution; and, third, the cumulative force which is utilized through that most wonderful factor and important evolutionary function, heredity. This selective and formative influence of function is seen in the teeth of the Gasteropoda, where variety in shape is a constant concomitant of variety in food; it is seen in the Mysticete or Balænoidea, where the great baleen plates are so admirably adapted to securing the low forms of life floating in the sea, and upon which this great whale subsists; it is seen in the Denticete, where the sharp, cone-shaped teeth are so admirably adapted to seizing live prey, upon which this sperm-whale lives; it is seen in the molars of the Herbivora, where the infolding of the enamel, with less dense structures, presents always on the masticating surface sharp, cutting edges for the division of dry and coarse vegetation; it is seen in the molars of the Rodentia and Proboscidia, where the antero-posterior movements of the jaw have developed the transverse layers of enamel which make them so efficient in the trituration of food; it is seen in the trenchant-shaped molars of the Carnivora (whether terrestrial, arborial, or fusorial in their habits), so efficient in their lacerating capacity; it is seen in the molars of the Edentata or insectivorous animals,—which, through the process of degeneration, have lost the enamel from their crowns,—standing like cylindrical posts, reduced not only in size but in numbers; it is seen in the marked tendency of children's teeth to decay, where their triturating function, or function of comminution, is delegated to the stomach; it is seen in the third molars of the black bear of Kentucky, which are modified from a lacerating carnivorous tooth to a grinding quadrilateral surface; it is seen in the third molar of man, where it is crowded out of position in the arch or impacted in the angle of the lower jaw; and, last but not

least, it is seen in this same animal, man, where the continued and abortive effort at specialization results with many in the reduction of the number of teeth.

In 1875 Dr. A. H. Thompson, of Topeka, Kansas, published in the Dental Cosmos a series of very interesting and instructive papers on tooth-evolution and retrogression. In some of his conclusions he stated that, judging of the future from the past, it was not improbable that the human family would eventually become edentulous. While fully recognizing a tendency to the diminution of the number of teeth in the human family, I am quite persuaded that this condition, which is also noticeable in other animals as well as man, is but in conformity with the law of specialization; but the diet or food-habit of man in this era, with countries so sparsely settled, is governed largely by the great abundance in both quality and variety of nutritious material. With this omnivorous habit, which is engendered by this superabundance of food, it seems quite impossible for it to exert sufficient decided influence on tooth-organization to result in any rapid modification or progress toward specialization; yet we may very properly speak of the human teeth as in a transitional stage,—an unstable condition,—which renders them an easy prey to both local and constitutional abnormal influences.

The increasing predisposition to toothache and other dental annoyances which many experience while laboring under mental or physical debility or exhaustion; the exalted sensitiveness of the teeth during gestation and lactation; the almost uniform certainty of the loss of two or more teeth by the average mother for every child nursed; the greater predisposition of teeth to decay in youth over adult life; the uniformity with which the teeth of a child resemble in conformation and structure those of one of its ancestors; the certainty with which the influence of a specific taint transmitted from parent to progeny is shown upon the teeth; the recognized fact that dental caries always attacks the external surface of the tooth first, and in such localities as are difficult to cleanse, and from these points advances towards the centre,—speak in unmistakable language of the fact that these physical, mental, moral, dietetic, hygienic, and hereditary causes of tooth-disintegration or degeneration gain much of their destructive force from the unstable condition of tooth-tissue resulting from absence of function and diverted nutrition.

A few words now upon the origin or evolution of tooth-germs, and I shall not longer tax your patience. As we study the development of the more complex structures from those that are more homogeneous and simple, we find a remarkable similarity between the evolution of the organism and that of the individual organ. In

the development of the mammal from the fertilized ovum, continued segmentation soon reduces this primitive germ to an aggregation of cells. In appearance the peripheral ones are of greater definiteness, and are distinguished from the inner ones by their enveloping membrane and greater completeness. Through the various progressive changes which the embryo is now passing from indefiniteness, the differentiation is marked with increased distinctness and precision, though modified or exalted in its development by the distribution of food or nutrition in the protoplasm of which the various segments are formed. Segmentation is followed by a series of changes which result in the grouping of the embryonic cells into definite layers, or membranes, known as the germinal layers or blastoderm. These have been designated epiblast or ectoderm, mesoblast or mesoderm, and hypoblast or endoderm, and it is by the further augmentation of these layers that the organs of the adult become built up; and so independent and definite are they in their results that embryologists speak of the organs as derived from one or the other of these germinal layers.

The epiblast is essentially the primitive integument, and from it is derived the skin, cuticle, nervous system, and organs of special sense. The processes by which the germinal layers take their origin are greatly influenced by the character of the segmentation, which, as we have already stated, upon the evidence of F. M. Balfour, is dependent largely upon the distribution of nutrition.

The epiblast, as above noted, forms the epidermis, and from it all such tegumentary organs or parts of organs as are epidermic in nature. Among these are the teeth, which in the most primitive types are but slightly modified scales. If, for an example, we examine the toad-fish, we find the two sharp spines with which the jaws are armed, one in each, are in the young fish so entirely identical with those covering the body that the closest scrutiny can distinguish no dissimilarity, and even after function has exerted its modifying or specializing influence for months or years, the resemblance to the dermal appendages is remarkably accurate.

A second illustration is given by Charles S. Tomes, where he says, "If a young dog-fish about to be hatched be examined, it will be found that the skin from the external surface extends in upon the jaw, carrying with it spines (placoid scales), but slightly modified." These, under the influence of subsequent function, become of greater size and differentiated from their earlier condition. The teeth of the shark may also be mentioned as being but modified or highly developed spines, change of location and function accomplishing the result. In fish and reptiles the teeth in different parts of the mouth vary but slightly from each other, so that these animals may be

termed homodonts; while with mammals this similarity is the exception, and though they all have a common origin, their location in different parts of the mouth subjects them to an unequal force and varied influences; hence the result, which, instead of producing teeth uniform and simple in shape and structure, produce those which are definite and heterogeneous.

In the remarkable changes which take place in the evolution of complex teeth from those of simple structure, we must note that the impulse must be given to the germinal membrane. The tooth of homogeneous structure is not changed to one of greater complexity, but the membrane itself from which it originates, impressed and modified by the laws controlling adaptation to environment and heredity, must receive its formative influence, and through that and the nutritive currents must evolve the differentiated structures resulting in the ameloblasts and other tissues, which are so essential to the development of the complex tooth. So, my friends, we gradually ascend the scale of organisms and organs, and in this uplifting we recognize that each step in advance is marked by an increased complexity and definiteness of structure, and that the teeth, in common with other organs of the body, have been gradually evolved from an incoherent homogeneity to a definite, coherent heterogeneity by the unyielding, ever-acting laws controlling adaptation to environment and heredity.

DENTAL CARIES.—V.

BY A. MORSMAN, M.D., D.D.S., IOWA CITY, IOWA.

(Continued from Vol. xxvii, page 722.)

PART SECOND.—NOSOLOGY.

2. Etiology.

For convenience of study I shall divide the progress of dental caries into two stages: first, decalcification; second, putrefaction. It is well to premise by saying that these two stages have no distinctiveness, and cannot be separated in the actual course of the disease. Both are in progress at the same time, or at least their intervals of occurrence are indistinguishable. The division is therefore purely arbitrary, with the view of facilitating study.

Decalcification.—Entering into the formation of the tooth are certain inorganic compounds,—the so-called lime-salts of the tooth. They are, principally, calcium phosphate and calcium carbonate, with some others of minor importance. Altogether they form from seventy-five to eighty per cent. of the tooth's substance. *All are insoluble compounds.* During the progress of caries the substance of the tooth—these compounds included—is gradually removed,—

washed away, so to speak, not in fragments or granules, nor in "histological elements," but *in solution*. There is but one way by which an insoluble* inorganic compound can become soluble, and that is by chemical change. In other words, the compound is not the same. A change has occurred, wherein the elements of the compounds have separated and re-united with other elements to form new compounds. Nor can this change occur except by the agency of another chemical compound, which is also disrupted, and an interchange of elements takes place. This is just what has occurred in the case under consideration. Insoluble inorganic compounds have become soluble. What is the agency, the other compound, that has produced the change? It is useless to look for micro-organisms—useless to look for inflammatory action. Chemistry alone can account for it. An examination of the compounds themselves will show us the agency that caused their disruption.

Calcium carbonate and calcium phosphate are ternary compounds of calcium with carbonic and phosphoric acids. That is, the calcium has replaced the hydrogen† of these acids. Now, phosphoric and carbonic acids are both of weak combining power, and in the presence of stronger acids they cannot retain the elements with which they are combined. In the presence of all other compounds they do retain their integrity. This change must therefore be brought about by some acid base having a greater "affinity" for calcium than have the acids with which it is already combined. No other conclusion can possibly be reached. Do observations bear us out in these conclusions? They certainly do. The contents of every carious cavity in which the disease is progressing give an acid reaction, and the disease can be counterfeited by acids out of the mouth. Only two questions remain: What are the acids concerned in this dissolution, and what is their origin?

Experiments have shown that all the mineral acids and many of the organic acids are capable of producing this reaction. We shall therefore be obliged to consider what acids are likely to be found in the mouth. I say "likely to be found," because, as yet, we do not know what acids *are* to be found there with any degree of positiveness, and suspect more than we can identify.

I see no reason for assuming that the mineral acids are ever in the mouth, except when placed there medicinally, and I do not believe

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* Of course, I use the terms "soluble" and "insoluble" in the chemical sense.

† The formula for phosphoric acid is H_3PO_4, and the formula for calcium phosphate is $Ca_3P_2O_8$. The formula for carbonic acid is, theoretically, H_2CO_3, and of calcium carbonate $CaCO_3$. Carbon di-oxide gas is not carbonic acid until hydrated, and does not act as an acid save in the presence of moisture. The acid is not a "stable" compound, and exists only during action.

that they are, when so used, factors of much consequence in dental caries. We can lay them aside in this connection for considerations of greater importance. Those acids which are likely to exist in the mouth, and which we are tolerably certain do exist there, are acetic, lactic, butyric, citric, malic, tartaric, and carbonic.

In considering the origin of these acids we recognize three possible sources. First, their normal existence in the normal mouth; second, their formation in the mouth; and, third, their injection into the mouth. This brings us to the conditions surrounding the teeth.

The Saliva.—It is not necessary to go into the composition or physiological action of the saliva. It will suffice for our purpose that it is a mixed fluid,—the product of several glands, and the secretion of the mucous membrane. Some very loose statements have been made as to the acidity of the mucus and saliva. The experiments of Claude Bernard have demonstrated beyond cavil that the mucus and all the salivas are alkaline in their purity. I make the statement with perfect confidence that it will be generally accepted in the future, if not now, that these secretions are never acid, either in health or disease, *as they enter the mouth.* Nor do I make any exception of the secretion from an inflamed mucous membrane. How an alkaline fluid can become acid except by fermentation or the addition of acid, and how this change could be accomplished *in the tissues*, I cannot comprehend.

The saliva in its purity contains organic matter in solution; it is therefore liable to fermentation when placed under essential conditions. All the conditions of fermentation are realized in the mouth,—heat, moisture, atmospheric air, and the presence of a ferment. When, therefore, the saliva is retained in the mouth it takes on the acetous fermentation. In localities capable of retaining it we may therefore get an acid reaction. Such localities are: at the margin of the gum, especially in the posterior of the mouth; in the interspaces between the teeth; and in the sulcus formed by the gum and the mucous membrane of the cheek and lips. In making tests, however, we must bear in mind that all these localities must be thoroughly cleansed prior to making the test, and no ingesta should be permitted in the interval; otherwise the fluid is contaminated by food and débris that vitiate the test so far as the saliva itself is concerned. I deny, therefore, the normal existence of acids in the normal mouth.

The second proposition, the formation of acids in the mouth, necessitates a more extended study. All organic matter returns to its elementary condition through one of two processes,—fermentation or putrefaction. During both processes acids are formed. It is presumed that the reader is familiar with this portion of the subject.

As I have already said, all the conditions of fermentation exist in the oral cavity, and an examination of the organic matter found therein will show us what acids are most likely to be produced. This matter is in the shape of débris and waste retained around and between the teeth, and has its inception in foods.

Starchy and Saccharine Substances.—These are readily fermentable, becoming first glucose, then alcohol, and finally acetic acid. This acid acts very violently upon the teeth. According to Leber and Rottenstein's experiments,* it decalcified in seventeen days the enamel and a portion of the subjacent dentine of a tooth placed in a solution of one part to one thousand. Acetic acid is constantly being formed in mouths when foods are allowed to remain, and is in my opinion the most potent for evil of all the oral "tigers."

Animal substances are, broadly speaking, fats and albuminoids. Their fermentation and putrefaction are exceedingly complex. Numerous processes are going on at the same time, and a large number of highly complicated products result. Leucine, fatty acids, tyrosine, etc., are the primary, and ammonia, sulphureted hydrogen, hydrogen, and nitrogen are secondary products. Lactose is usually formed and breaks up into lactic acid. At the end of seventeen days a tooth placed in a ten per cent. solution of lactic acid showed a very decided action.

The lactate of lime is no sooner formed than a further change results in the formation of butyric acid, which also acts upon the teeth, but not so violently as the two preceding. Butyric acid is but the beginning of a list of somewhat similar compounds, but they are probably not of much importance in this consideration.

During all these processes carbon di-oxide (carbonic acid gas) is evolved in considerable quantity. In the presence of moisture it might form carbonic acid, and as such would act upon the teeth. I think it is doubtful, however, if this reaction occurs to any very great extent, owing to the volatility of the gas.

The saliva, as I have already indicated, is also subject to putrefaction when retained in the mouth, or when loaded with other fermenting matters. On rising in the morning, if a test be made, the saliva of a perfectly healthy person may be found slightly acid. Its results would be similar to the preceding.

The effect of the acids of putrefaction upon the teeth cannot be readily estimated. With the exception of lactic acid, I do not think that they have very much influence in the production of caries. Indeed, it is doubtful if the reaction during putrefaction is not pretty constantly alkaline. Still, they must be looked upon as possible

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* "Dental Caries," Chandler's translation.

factors in the disease. All acids act more violently in the nascent state,—that is, at the moment of their formation; an additional power, therefore, in this connection.

Our third proposition considers those acids taken into the mouth.

Acetic acid in the form of vinegar is largely used as a condiment. Its effects have already received attention.

Citric, tartaric, and malic acids are all fruit acids, and in that form are largely used. In solutions of one part to one thousand they act profoundly upon the teeth.

There are a great many acids used medicinally. Taken constantly, they become an added cause of anxiety, but it is an exceedingly small per cent. of caries that can be charged to them. Their ill effects are readily prevented.

Coming properly under this head are acid eructations from the stomach. In indigestion, dyspepsia, and the stomachic derangements of pregnancy acid eructations are quite frequent. Doubtless they add to the general result in the production of caries. I am inclined to give them less influence than is customary.

I feel compelled to discuss the effect of pregnancy as an inducer of this disease, although, in my opinion, except incidentally, as mentioned above, it should not be ranked among the causes. There is a quite general belief that pregnancy is capable of producing an absorption from the tooth of its lime-salts, decalcifying for the benefit of the growing fetus. I hardly know how to combat so irrational an opinion. Of all the hard tissues the teeth are the least likely to be attacked by pathological absorption, because of the total absence of a capillary or absorbent system,* and if so attacked the cement would be first taken. Nature always works by direct methods, and obviously could obtain lime-salts from bones where the circulation is perfect and absorption easy, more directly than from the teeth where absorption, even if possible, would be exceedingly slow and difficult. Nature is also conservative; she does not tear down one elaborate structure to build another when simpler materials are at hand; and except in *very rare* cases there is an abundance of lime in all our foods. Now and then the appetite of a pregnant or nursing woman indicates by chalk-craving the demand of the system for lime. Put her on good food, and *if it is* a natural appetite the craving will cease. Pregnancy is not an abnormal condition; it is physiological, and almost all women improve physically during its term. Isolated cases do not make a rule.

Strange as it appears, osteomalacia has been cited as evidence that

* I do not deny the *possibility* of absorption in the teeth. That force which deposits lime-salts *may* also be capable of removing them. I deny the *probability*, because the evidence we now have is against it.

this absorption of the lime-salts of the tooth is not improbable. Osteomalacia is not an absorptive process; it is a disease of assimilation. The bones are constantly wasting and as constantly being supplied (in health) with lime-salts. In this disease the salts are not assimilated, but the waste goes on. More than that, in no history of the disease that I can find is anything said about the teeth.

Aside from this belief, there is a general opinion that, however accounted for, caries is more common during pregnancy than at other times. My observations lead me to believe that this statement is entirely untrue. Laying aside those cases in which stomachic irritation is excessive and prolonged, there is no danger from this cause.

The cause of decalcification, therefore, we ascribe to the chemical action of acids, the principal source of which is the fermenting foods, débris, and saliva retained in the mouth, and the most active of which I believe to be acetic acid.

Putrefaction.—Besides the lime-salts of the tooth, the inorganic portion, there is about twenty-five per cent. of organized matter,—the fibrils or life-giving portion, and the matrix or gelatinous portion. This organic portion of the tooth is not acted upon to any great extent by the acids we have been considering. All disintegration of organic matter must be by means of putrefaction or fermentation, according to its nature. The nature of *this* organic material necessitates the putrefactive process. Now, both putrefaction and fermentation are inseparable from and dependent on organic life, and in the putrefactive process accompanying the destruction of a tooth by caries we find, either as an accompaniment or as a cause, those microscopical germs which are identified with putrefaction elsewhere. Do these germs destroy this organic matter of the tooth, or does the process make a habitat favorable to their existence? Speaking generally of putrefaction, there is little room for doubt that these germs are the causative element, but their method is as yet undetermined. Putrefaction of tooth-substance does not differ from putrefaction elsewhere, and I see no reason for assigning to parasites the prominence which has been given them in the production of caries. They destroy tissue here just as they destroy it elsewhere. How they do it is as yet unknown. It seems like folly, in the absence of accurate knowledge on the subject, to make the claim that these germs are tooth-destroyers, save as they are in a general way productive of the putrefactive process. The experiments of Dr. Miller* have shown conclusively that they have no influence upon sound dentine, and that they do not *precede* decalcification.

* Dental Cosmos, vol. xxv, p. 3.

As I have already stated, the processes of decalcification and putrefaction are co-existent in the progress of caries, and the effects produced by both these causes constitute the disease. I accept therefore the chemico-putrefactive theory.

(To be continued.)

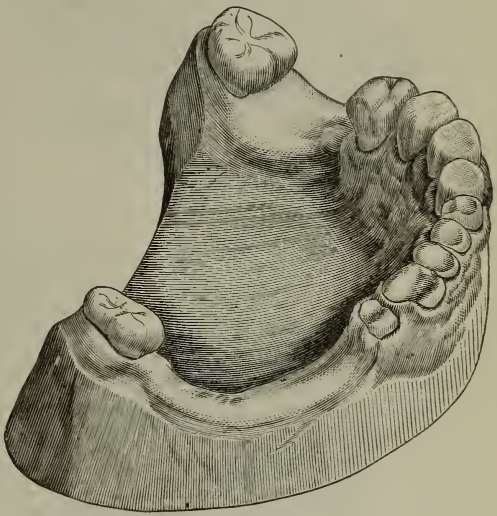
REMOVABLE BRIDGE-WORK.—PORCELAIN CAP-CROWNS.

BY R. WALTER STARR, D.D.S., PHILADELPHIA, PA.

The case of Mr. W. presented difficulties of an unusual character, as may be seen by inspecting the illustration, Fig. 1, which renders detailed description unnecessary.

It will be observed that the molars and the left second bicuspid overhang to a degree that would make the taking of an accurate impression by ordinary methods well-nigh impossible. After a careful study of the case, it was decided that two separate pieces of removable bridge-work should be attempted, and, as an essential preliminary step, the overhanging sides of the molars and bicuspids were ground with engine corundum wheels and points until those sides were made much less inclined, when plaster impressions were taken, first of one half, and then of the other half, of the jaw. Gold cap-crowns were closely fitted over the molars, left second bicuspid, right first bicuspid, and cuspid stump. Gold crowns were made to telescope over all the caps, which were then, by means of oxyphosphate cement, fixed firmly on the teeth. Suitable plate-teeth were selected, fitted, backed, and hard-waxed in place between the telescoping crowns. After hardening the wax with cold water from a tooth-syringe, the pieces were carefully removed, invested, and soldered. The two completed bridges were easily replaced on or removed from the supporting capped teeth, and their appearance when detached is correctly shown by the illustration, Fig. 2, which also shows the capped teeth

Fig. 1.



and stumps. This figure likewise shows the results of the novel method employed in crowning the incisors. Gold collars were fitted tight on the necks of the incisor stumps, and the new-style porcelain caps adjusted in the collars, and set in the oxyphosphate cement which had been packed into the collars; thus at the same time fastening the collars on the stumps and the caps in the collars, as shown completed in Figs. 2 and 3.

Fig. 2.

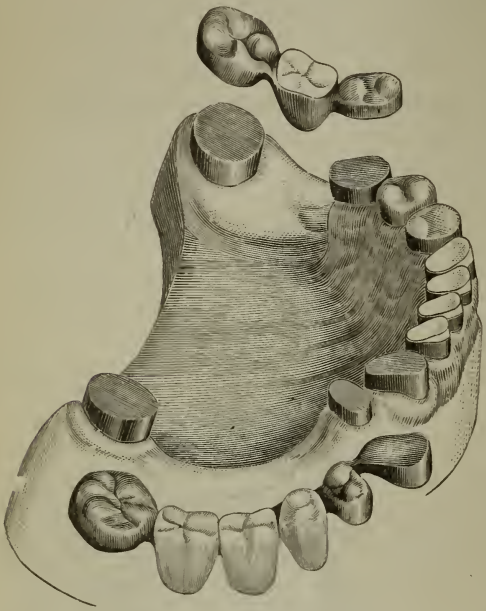
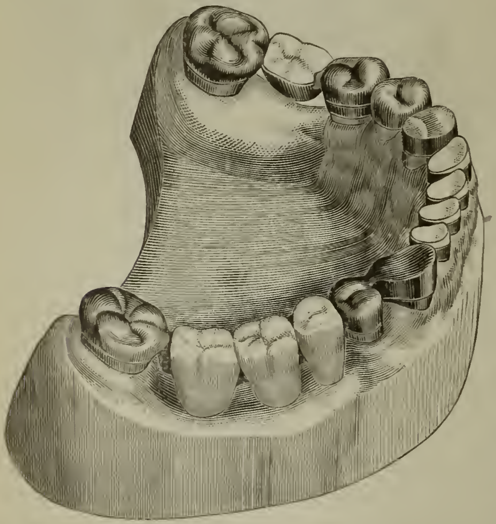


Figure 3 illustrates the finished crowns and bridges, which latter were secured in position by placing a small piece of gutta-percha in each of the telescoping cap-crowns, which were then warmed and carefully pressed in place,—the gutta-percha filling only the spaces between the flat tops of the caps of the natural teeth and cusped caps of the bridges.

Fig. 3.



Whenever, for repair or for any other purpose, it shall become desirable to remove one of the bridges, that may readily be done by applying a hot instrument or hot air to the caps to soften the gutta-percha sufficiently to permit the telescoping bridge to be taken off.

A full upper vulcanite denture was made to replace the old one, which, by improper occlusion, had thrown the full force of mastica-

tion on the anterior teeth of the lower jaw, and produced the destructive action that resulted in the deplorable loss of tooth-substance shown in Fig. 1.

The prosthetic devices thus briefly described have so far proved perfectly satisfactory to both patient and dentist. The obvious difficulties of the case, and the somewhat novel means employed in supplying useful and secure dental substitutes, seem to justify the writer in bringing the case to the attention of the profession.

SPREADING THE DENTAL ARCH.

BY E. S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

In order to insure a sharp impression of the necks of the teeth and margins of the gum, it is necessary to let the plaster set fairly hard in taking impressions of the mouth for regulating the teeth. Two impressions should be taken,—one for a model, with the patient's name upon it, to be kept for reference and study; the other to be that upon which the plate is to be made, if necessary. In preparing

Fig. 1.

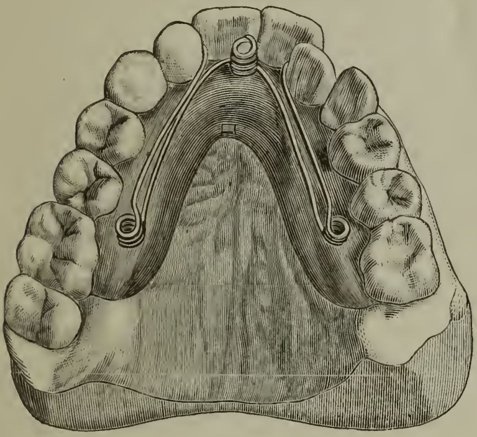
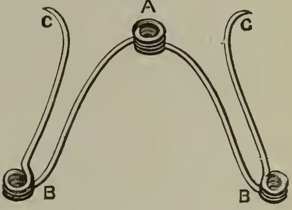


Fig. 2.



the model, the necks of the teeth at the margins of the gums should be slightly scraped, and the spaces between the teeth should be trimmed out so that the points of the plate will lock in. When this is done, the plate will generally stay in place without the use of ligatures, particularly if the Talbot-Norton spring is used, as the force is extended directly across from one point to the other. To obtain the best results the extremities of the arms should be properly fixed. The plate should be made as thin and elastic as possible, so as not to fill the mouth, and to offer the least resistance to the spring. Fig. 1 shows a practical case in which it was neces-

sary to expand the arch, including the lateral incisors. The spring is a modification of the one illustrated on page 275, Dental Cosmos for May, 1885. The advantage claimed for this spring is in the coil. It gives greater ease and motion, and the force is more evenly distributed, than can be obtained by the straight wire. The spring (see Fig. 2) has one coil, A, the fixed point. From this extend two arms for the purpose of expanding the posterior part of the arch. B B are coils at the extremities of the arms, and are movable and fixed points,—movable for the purpose of expanding the extremities of the plate, and fixed for the arm extending to C C. In this case both arms are bent to force out the lateral incisors. The coils, B B, and the arms, C C, could also be bent so as to draw in or rotate any of the teeth anterior to B B. It is better to polish the plate and then put the post in than to vulcanize the post in the plate.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION—TWENTY-FIFTH ANNUAL SESSION.

(Concluded from vol. xxvii, p. 733.)

Third Day.—*Evening Session.*

Section VI was passed, and Section I, Prosthetic Dentistry, Metallurgy, and Chemistry, was called.

Dr. C. S. Stockton read the report, which had been prepared by Dr. William H. Trueman, as follows:

In the last report of this Section we referred to a process of constructing dentures of vulcanite, in which the usual method of flasking and packing was dispensed with. The idea was culled from several articles in various English dental journals, which spoke of the decided advantages of the new process,—its cleanliness, the saving of time in construction, its safety to the teeth when the gums are ground very thin, and the decided advantage of absolute safety to the cast in cases where the alveolar border overhangs, or where from its shape it is liable to crush or break when the denture is flasked and packed in the usual way. The non-mutilation of the cast was also claimed as a marked advantage in difficult partial lower cases, and in fact in all partial cases.

A diligent search of the various dental journals published at home and abroad, and equally diligent inquiry of those supposed to be versed in such matters, failed to furnish the practical details of the new process. Recently, however, Dr. J. Spyer gave a demonstration,

in Philadelphia, of a process he has been using, that seemed to be identical with that referred to in last year's report, except that, after preparing the case for vulcanizing, he invests it in plaster in an ordinary flask; while in the English process the denture was firmly packed in finely pulverized steatite, or soapstone, and inclosed in an iron box, which took the place of the flask. The articles referred to also state that the soapstone was not injured during the process, but could be used repeatedly.

Dr. Spyer demonstrated the process in connection with an idea which he has invented and patented, and termed by him "Surface Cohesion Forms." These forms are made of tin-foil, or some similar metal, or combination of metals, about the thickness of the tin-foil or "patent metal" now on the market, and originally prepared for what is known as "stipple-work" in connection with the use of celluloid, and in general use for covering the cast in the ordinary manipulation of vulcanite to secure a clean, bright palatal surface to the denture. These "Surface Cohesion Forms" are embossed with a geometrical pattern somewhat like that impressed upon the foundation wax used by bee-keepers, but of a much smaller pattern. The pattern, we understand, is not important; the peculiarity and the really important feature Dr. Spyer claims is, that when the metal is stripped from the plate after vulcanizing it leaves a net-work of channels in the plate which all connect with one another, and thus instead of having a single suction cavity in the center of the plate there is produced a peculiar shaped one extending over the entire palatal surface. This, he claims, gives a much firmer adhesion, permitting a much smaller plate, with this additional advantage, that should the plate rock or tilt, from pressure brought to bear upon it when in place in the mouth, the suction will not be entirely lost, as is usually the case with the ordinary central cavity, but will still be maintained under those portions of the plate not materially displaced. He also claims that there is less irritation to the mucous surface of the mouth. The use of these forms is not confined to vulcanite or celluloid. For gold, platinum, or other metal, the "cohesion form" is cemented to the palatal surface of the cast, molded in sand in the usual way, and the plates swaged up. An extra zinc die may be needed to swage the lines of the form sharply. The forms, for use with either metal or vulcanite plates, are fitted and shaped so as to be about one-eighth of an inch less than the plate, leaving a margin all around.

The new method of packing as demonstrated by Dr. Spyer is as follows:

After marking upon the model the outline of the plate, and cutting or scraping the cast as may be desired to secure an accurate

fit for the edge of the plate, fit a piece of thick tin-foil, or of the "cohesion form," so as to be about one-eighth less in size all around the outline of the plate. Now, take the cement, made by dissolving the vulcanizable rubber to be used in making the denture in chloroform to the consistence of a thick syrup, and paint that portion of the model to be covered with the tin-foil, and immediately apply the foil, carefully pressing it in place. The cement under the form filling the depressions on its under surface, prevents them being crushed out of shape during packing and vulcanizing. (The forms may be used by the ordinary method of packing if desired; in that case, be sure to get enough cement under the form to well fill the indentations, and use it a little thicker.) In a few moments the cement will be set; now paint the upper surface of the foil, and as much of the surface of the model as is intended to be covered by the denture, with the cement, and adapt to it a piece of vulcanizable rubber previously cut to the proper shape, working it into place much in the same way that a wax or gutta-percha base-plate is fitted. On this mount the teeth; and, instead of holding them in place with the usual wax cement, use the chloroform and rubber and small pieces of rubber, packing them well under the teeth and around the pins. With a little practice, we are informed, this is readily done. It is desirable to warm the rubber slightly, so that it will cohere, and to use a hot instrument in packing it into place. After the teeth are in position, add rubber to form the rim, and build the rubber to the desired form, shape, and size, making the surface as smooth as possible,—in other words, prepare it for the flask, using rubber instead of wax. When ready, imbed it in plaster in an ordinary flask, making no provision for opening the flask, as it is not necessary, and screw the cover on tight before the plaster is set. When the plaster is thoroughly set, it is ready for the vulcanizer.

We have examined a piece of finished work made in this way; except at a few unimportant points it was as well done as by the usual method. The saving of time and labor, and its cleanliness, are decided merits. Not being able to adjust the denture in the mouth before finishing to test the articulation and arrangement of the teeth, is a decided disadvantage.

Without expressing any opinion of its practicability, we think it is a good thing to know, and may prove quite useful. In changing the springs on a Coffin plate, for instance, or in some repairing cases, it may be valuable.

Quite a long time ago Dr. Theodore F. Chupein, of Philadelphia, called attention to the usefulness of vulcanizable rubber dissolved in chloroform and evaporated to the consistence of a thick syrup as a cement for repairing articles made of rubber; for instance, he

repaired the bulb of a syringe by painting it with the cement, and immediately covering the injury with a piece of vulcanizable rubber. He found many useful applications of this cement in his laboratory.

Discussion.

Dr. Haskell. In the first place, with regard to artificial dentures in general, I have seen dentists before now who did not seem really to appreciate what vast differences there were in the mouths of certain patients. Patients will sometimes say, " Why can't I have a set of teeth that wear as well as Mrs. So-and-So's?" I reply, "Simply because you have not Mrs. So-and-So's mouth." There are some mouths into which you can almost throw a set of teeth and have them a success, and others will require all the skill that can be brought to bear, and all the patience that the patient can exercise, to bring the set into successful use. It is not difficult to insert an upper set of teeth in a mouth successfully when there is a good alveolar process; not too deep a palate, nor too hard, and where the lower jaw strikes squarely under; but the next case may be one where the conditions are all unfavorable—where the process has entirely disappeared and a flexible ridge remains, with the palate flat and very hard. And these cases are occurring to a fearful extent under the use of vulcanized rubber, on account of its non-conductibility. The less air can circulate under the plate the worse it is. If the suction is good and the plate adheres firmly and the air cannot circulate, the heat is retained, the membrane is inflamed, and in consequence of the abnormal condition of things the waste material that is carried off is not replaced. I was speaking of a mouth where the process was all gone. In addition to that the palate may be a very small one, and the lower jaw closing a quarter or a half of an inch outside of the upper jaw. In such a case the greatest care must be exercised, not only in fitting the plate, but especially in antagonizing the teeth. I have seen many plates in the mouth where the failure to antagonize rendered the teeth worthless, which by grinding and antagonizing were made quite useful. When the patient has reached that condition of things where he or she must wear a partial denture, the question arises what teeth shall be retained and what teeth removed. A simple rule that I have adopted and which I think is a safe one is, remove from the mouth whatever teeth are necessary to make the artificial denture as comfortable and as useful as possible, throwing aside all sentimentality with regard to extracting sound teeth.

While rubber is universally used, it is the worst material that is put into the mouth except celluloid, by reason of its non-conductibility. On the other hand, all metals are conductors of heat, and consequently preferable in the mouth. It is often said that un-

due absorption takes place in the mouth under the metal plates. It is true, but as a rule this is due to undue pressure at some point, usually in front; but those are exceptional cases. So, if it is possible to induce your patient to have a metal plate, do so. It is often said by dentists, "I have no demand for metal plates." Create a demand. It is for you to create a demand. Your patients never will do it. You must inform your patients with regard to these matters; educate them up to the point of wearing metal plates; and there is not a community in which some cannot be thus educated.

I want to give a few points in regard to impressions, casts, and so on. For taking impressions, I know many use other materials besides plaster. I simply say in regard to that that I have no use for anything but plaster. I find I can always rely upon a plaster impression. With regard to the preparation of casts,—in the first place, I use no air-chamber. It is of the utmost importance that your plate should not press against the hard palate. That I raise with a thin film of wax, the edge chamfered off so that it is undefined. You may call that an air-chamber; perhaps it is. If the mouth is not hard in the center, I fit the plate to the entire surface. Bevel the sides of the cast so that it will drop from the mold readily. For dies there is one metal, and so far as I know but one metal, that has all the requisites for a dental die, and that is what is known as babbitt-metal. The requisites for a dental die are these: Non-shrinkage, hardness, toughness, smoothness, and melting at a low temperature. You have all these in Babbitt-metal; but you want to be sure that you have a proper Babbitt-metal. One that costs less than 40 cents a pound is of no account, for the reason that materials have been put into it to cheapen it which spoil it for dental dies. Take the Babbitt-metal such as you can buy of the White Manufacturing Company, Justi, and the Chicago Dental Company, and you will have a metal made according to this formula: One part copper, two of antimony, and eight of tin, melted in the order named. To make counter dies, add something to your lead to reduce the melting point; say an eighth or a sixth of tin. Pure lead is also too soft for a die. By adding tin, you harden it as well as reduce its melting point.

With regard to bridge-work and teeth without plates, I wish to say, in the first place, that I consider what is called bridge-work is doing incalculable injury. The crowns of teeth are being ruined by that process. It is absolutely impossible to keep the portion of the denture, plate or no plate, that comes in contact with the gum clean. I have removed them from the mouth and placed them in the patients' hands, and they were disgusted to think they had had such things in their mouths. A sound tooth is covered with a gold

band. Of course the band does not fit the tooth, so it is attached with cement. How long does the cement remain there? Use in mastication will wear that loose, and it will disintegrate so that more or less of it will come out. The fluids and secretions of the mouth go in to stay. What is the result? The tooth is completely girdled with decay. Another result of an artificial denture fastened in this way to a natural tooth which is being masticated on, is that it finally becomes permanently loosened and worthless. Thousands of teeth are being ruined in that way. The least objectionable form of such work that I have seen is the work that Dr. Parmly Brown presented to you. I should say that in some cases that would be advisable and would do no harm. I would use it as a last resort. A narrow gold plate properly adjusted to the mouth and attached with clasps and kept clean does no harm. That plate can be removed to be cleansed, and a careful patient will see that it is kept sweet. The plate has a bearing on the gum, and the whole strain does not come on the natural teeth.

Dr. Ames. Until such time as our fellow-mortals shall cease to need the adjustment of entire dentures upon edentulous jaws, the satisfactory retention of such appliances will be one of the important subjects for consideration in this Section.

These dentures must be sustained, if sustained at all satisfactorily, either by the use of spiral springs or by the pressure of the atmosphere. The spiral springs being so seldom required, I will say nothing of their use. A quite universal method of taking advantage of the pressure of the atmosphere is by the formation of a chamber over the palatal portion of the denture where, by the partial evacuation of its contents, an unequal atmospheric pressure is produced, giving some support. If this support be at all considerable, the tissues soon entirely fill the chamber, if it be a shallow one, as the natural result of constant traction upon them, and while making use of this method I found that more support could be obtained from a shallow cavity than from a deep one, for the reason that, air being expansible, the greater the quantity contained within the chamber the easier it is expanded sufficiently to allow the denture to entirely leave the surface of the jaw.

This method I abandoned some time since, and now give preferance to one by which a denture is constructed devoid of any chamber or space whatever between it and the surface of the jaw. A few dentists employ methods by which dentures are similarly constructed, but I have never seen or heard a statement from any of them giving definite rules or instructions for the construction of such dentures in such a way as to not only equalize the bearing but also to procure a powerful atmospheric pressure just where needed, and there only.

You all understand the methods of trimming the impression and model for the distribution of the bearing of the denture upon the surfaces of the jaw, which are of variable resistance; but this is not sufficient to obtain the best results. The plate must extend in all directions to a point where its edge can be made to slightly displace lax tissues. I mean by this that it must extend posteriorly to a point where the soft tissues of the palate are sufficiently lax to allow of slight displacement by the edge of the plate, and that it must extend well up beneath the lip and cheeks so that they lie snugly upon its edge.

In this you have a denture which does not exert any perceptible traction upon the tissues when in position, but immediately upon its displacement from contact with any part of the surface of the jaw atmospheric pressure is produced over such part, from the fact that all edges of the denture are slightly displacing lax tissues, which follow the edge downward and prevent the entrance of air between the denture and jaw. After constructing a denture upon this principle, I find it necessary to instruct the patient, when removing it, to raise the lip free of the edge, thus admitting air.

Dr. Morgan. I wish to notice one or two errors that my friend Dr. Haskell made, and which I think are fundamental. I do not wish to appear here as the champion of rubber, for I recognize, as you all do, that in many respects it has been a damage to our profession and to the public, and in many respects it is a very poor article as a basis for artificial teeth, and that in many mouths you meet with difficulties that you would not if your patient had been wearing gold. The doctor spoke of undue heat in the mouth due to the use of rubber. I think he is mistaken. Mucous membrane is not the eliminator of heat in the body. You never get the mucous membrane above blood-heat until you have irritation and inflammation. It is impossible that heat should be eliminated from the general system and held in the mouth so that the heat of the mouth will be above the heat of the body. He must go further back than that before he comes to the prime difficulty which results in the production of the large amount of loose tissue which is frequently found upon the alveolar borders, especially in the front part of the mouth. I recognize that this condition is frequently met with, and that it is a serious difficulty in the way of adapting artificial dentures so as to make them serviceable.

He said that "all natural teeth should be removed that interfere with the comfort of the artificial denture." Suppose you had occasion to insert upon a plate two superior incisors. Every one knows who has had experience that if the remaining teeth were removed a substitute could be adapted that could be worn with much greater

comfort than could the one carrying only the two teeth. Should he take them out? I think not. The principle that the comfort and usefulness of the natural teeth that remain in the mouth are not to be considered, and all of them are to be removed that interfere with the comfort of the artificial denture, is an incorrect one.

I agree fully with him that metallic plates are worn with much more comfort to the patient than those made from rubber, as a general rule.

Dr. Horton. The last speaker claimed that there was a misapprehension on the part of Dr. Haskell as to the cause of the loose tissue referred to. Will he please give us a little information as to what he thinks is the real cause?

Dr. Morgan. I do not know why it is so. I believe it occurs more frequently under rubber than metallic plates, but the cause lies back of the retention of heat.

Dr. Atkinson. There has so much error been promulgated to-night that I cannot forbear speaking. I should judge from the remarks of the gentleman from Chicago, whose reputation as an artificial workman is universal, that he had never seen a properly constructed bridge-piece. If we were to confine our observations to Washington's teeth, we might condemn the whole of dentistry. If the gentleman had seen one single well-constructed bridge-piece, he could not condemn such work as he has done to-night. If he will come to New York, I will show him some clean mouths that have worn all the various kinds of appliances, from gold down to that delightful thing (to some minds) rubber. I will show him the pieces in the mouths where there is a perfect restoration, simply by putting in bridge-pieces. But you must have your bridge-piece attached intelligently, and the great mistake among men who are using bridge-work is that they are not physiologists nor pathologists; they do not know when they have the mouth in a condition to bear the insertion. They are not judges of artistic and mechanical appliances, and do not know when they have the teeth properly occluded so that each tooth shall do its proper share of work.

As to this rubber business, gentlemen talk with their mouths open when they defend rubber and say it cannot produce heat, but it must produce irritation. No man can tell when the primal irritation occurs. The great curse of rubber is that it anesthetizes the sensory nerves by reason of its non-conductibility. It then paralyzes the vaso-motor nerves in that little group of capillaries in the gum, so as to allow the blood to flow in and remain in little lakes, and, instead of retrograde metamorphosis, we have these mugwump mouths that are not satisfied with the correct order of things, but go wiggling all around, not closing twice alike.

Dr. Haskell. Dr. Atkinson has so admirably answered Dr. Morgan in regard to the effect of rubber in the mouth that it is not necessary for me to say anything. In regard to the case which Dr. Morgan cited, he seemed to think that I meant that it was necessary to extract all the remaining teeth. That is an extreme case, because two teeth could be put in and made comfortable and useful without extracting any other teeth. I should have said, in partial cases where many teeth are missing. In reference to Dr. Atkinson's remarks with respect to bridge-work, I excepted the very method that Dr. Atkinson advocated, as introduced by Dr. Parmly Brown, and said that that was the most favorable form that I had ever seen of bridge-work. It certainly is the most cleanly.

Dr. Morgan. I would like to ask Dr. Atkinson if he meant to say increase of the heat in the mouth above the heat of the body would occur without irritation?

Dr. Atkinson. No, I did not. I did say that irritation could not be perceived by any means known to me until after it had passed beyond the point of irritation and induced retrogressive metamorphosis of the tissues.

Dr. Morgan. That is what I meant to say,—that you had no increase of heat from any plate in the mouth until there was irritation and the beginning of inflammation, and Dr. Atkinson, instead of combating the idea which I advanced, exactly confirms it.

Dr. Spalding. If gentlemen will take the trouble to test the actual temperature of the mucous membrane under rubber plates, and test it under gold plates, and test it without a plate, I will venture to say that they will not find the fourth part of a degree of difference in the temperature. The claim that heat is generated under such circumstances can easily be determined by the application of the thermometer.

Dr. Brophy. It has been well said that the tissues beneath the plate become inflamed. Why is it? It is simply for this reason: rubber not being a good conductor of heat or cold, the capillaries of the vessels beyond that portion of the membrane covered by the plate contract when hot or cold substances come in contact with them, while those immediately beneath the plate do not. The consequence inevitably must be that the blood rushes for the capillaries which are dilated, and they are overcharged. This produces what Dr. Atkinson said you would find, little lakes of blood beneath the plate, and then follow congestion and absorption of the alveolar process. Micro-organisms may be another cause. Almost any plate is covered with them, and they in time produce irritation.

Dr. Spalding. The ordinary and simple reason why the mucous membrane is irritated under the rubber plate is because the surface

of the plate is not smooth. It arises from mechanical irritation, owing to the roughness of the plate. Any rough surface applied to the mucous membrane will eventually produce irritation and inflammation.

Dr. Barrett. Dr. Spalding will find if he polishes the inner sur- of the rubber plate he will simply aggravate the disturbance. That is practical common sense and practical experience.

Dr. Atkinson. It is the shutting up of the mucous follicles that is the immediate antecedent of the mischief, so that those people who persist in wearing plates during their sleeping hours, and do not give the mucous follicles opportunity for breathing at least a part of the time, may expect that the inception of the mischief has already set in.

Section I was passed, and the association adjourned to 9 A. M., Friday morning.

FOURTH DAY.—*Morning Session.*

The association met pursuant to adjournment, President Crouse in the chair.

On motion of Dr. Dudley, a committee of seven was appointed to take into consideration the feasibility of holding an International Dental Congress in 1887. The committee is as follows: A. M. Dudley, Salem, Mass., chairman; C. N. Peirce, Philadelphia; M. W. Foster, Baltimore; Frank Abbott, New York; T. W. Brophy, Chicago; A. H. Thompson, Tepeka, Kansas; Joseph Bauer, New Orleans.

Dr. A. H. Thompson, Topeka, Kansas, moved the following amendment to the constitution, which lies over under the rules:

To amend Section 2 of Article VI to read as follows:

Section 2. It shall be the duty of each permanent member to indentify himself with one or more of the above-named sections, and he shall inform the recording secretary of his choice at the time of joining the association. At the close of the morning session of the second day of the annual meeting, the roll of members in good standing shall be called for the annual reorganization of the sections, and each member shall answer to his name by announcing his choice of sections. The sections may, by permission of the association, hold separate meetings for the reading of papers and discussions, and report the same in abstract to the full meeting of the association.

Dr. Thompson reported that Section VII would investigate the following subjects during the coming year, and they would request the co-operation of all members in the work: 1st, normal and abnormal qualities of the oral fluids. 2d, the tongue in health and disease. 3d, personal hygiene for the dentist. 4th, continuation of the study of the etiology of dental caries.

Dr. E. Parmly Brown read a voluntary paper, entitled "The Past, Present, and Future of Dentistry."

The election of officers and selection of the next place of meeting was announced in order, and resulted as reported on page 552, Dental Cosmos, September, 1885.

Dr. C. N. Peirce, Philadelphia, offered an amendment to the constitution as follows:

To amend Article IV, by striking out the words "the place of meeting shall be determined each year by vote of the association," and inserting in their place the following:

"The place of meeting shall be determined each year by the Executive Committee, and notice of the selection made announced to the members of the association through the dental journals not later than the first of March preceding the annual meeting."

Dr. A. O. Hunt, chairman of Section II, Dental Education, read the report, which outlined the work done by the National Association of Dental Faculties.

The newly-elected president was installed, and made a few remarks, returning his thanks for the honor conferred upon him.

Adjourned.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Tuesday evening, October 6, 1885, in the rooms of The S. S. White Dental Manufacturing Co., Broadway and Thirty-second street.

The president, Dr. William Carr, in the chair.

Dr. W. H. Atkinson, of the Clinic Committee, reported that at the clinic held September 22 there was an attendance of about sixty, and that Dr. F. W. Seabury, of Providence, R. I., gave a short descriptive lecture on vulcanizing rubber in superheated steam by means of the Seabury apparatus. Dr. Starr, of The S. S. White Company, exhibited models and mandrels for forming gold bands for crown-work, and specimens of his new system of bridge-work; he also presented a new mouth-gag. Dr. G. W. Weld presented a patient affected with chronic hyperemia of the lips.

Dr. Atkinson's report of the clinic held October 6, 1885, was as follows:

There were about sixty present at the clinic to-day. Two cases of pyorrhea alveolaris were presented. A mere verbal description of them would be of little service to any one who has not already a good mental grip of this disease. Like almost every other path-

ological condition, it must be seen to be comprehended. Therein is the value of clinical teaching and the presentment of actual cases. Dr. Hubbard, of Brooklyn, presented a case that has been under treatment since May. He began to think it was not getting along as well as it should. He had really made very good progress. Upon examination, some little points were found that had not been thoroughly attended to. Dr. Mills recognized the same points and showed how to treat them. In the other case, by request of Dr. Spooner, I tied the inferior front teeth with ligatures, last Friday, and trimmed them to get a proper occlusion, so that each tooth should bear its own share of the impact of the jaw. I also dressed the places where pus was discharging very abundantly around both superior lateral incisors and three or four of the inferior teeth. All the incisors below were more or less involved. The right superior lateral discovered no pus until pressed hard enough to make it doubtful whether it was pus or pabulum that came down under the flap of the gum that was very much affected by the destructive process. Dr. E. T. Starr exhibited his new system of crown and bridge-work.

President Carr. I now have the pleasure of introducing to you Professor Carl Heitzmann, who has kindly consented to lecture upon the subject of

Microscopy as a Guide in Practical Dentistry.

Professor Heitzmann. Mr. President and Gentlemen: I am not a practical dentist. My practical work in dentistry is confined to cleaning my own teeth. I have, however, undergone a great deal of practical work at the hands of others. I am by birth a Hungarian, and, as you know, the care taken with the teeth abroad is very much less than in this country. There they neglect to attend to their teeth while they are young, and the result is, as an old physician described it, "When I was young I had splendid teeth, but nothing to bite; and now when I am old I have plenty to bite, but no teeth."

If, nevertheless, I undertake to speak about some practical points concerning dentistry, I do it for some good reasons. In my laboratory I have often alluded to practical points which I by mere reasoning—and I suppose logical reasoning—have obtained a knowledge of, and frequently I have been asked the flattering question, "How is is possible, doctor, that you know so much about dentistry?" My modest answer was, "I don't know anything about it, but have simply given you what I have learned from observations under the microscope concerning practical work in dentistry." Upon receiving the invitation of my friend Dr. Walker to address you, I thought it might be well to talk about these matters in a public way, ex-

pecting that some of you, gentlemen, will take sufficient interest in the topic to reason it over, and perhaps it may lead some of you to further studies in the beautiful science of microscopy.

You know, gentlemen, that our modern views concerning the structure of the animal body are widely divergent from those that were held even as late as ten years ago. If I say "our," you will kindly pardon me. Perhaps I ought to say *my*, when we consider the enormous success that my laboratory has met with during the last ten years. There are gentlemen constantly coming from all parts of this country, and I might almost say from all parts of the world, for at the present time I have in my laboratory a gentleman from Central Asia; another who, although born in America, comes to me from China, and a third one came from the Barbadoes. I dare say most of them leave the laboratory as my warm friends, and have very materially changed the views they formerly held, and which are still held to be true in Europe, as to the construction of the body.

According to the previous views the body was composed of cells, each cell being considered to be an individual, many millions of such individual cells being put together into one mass to form the body in general; whereas, I claim that there is no such thing as a cell in our tissues. What I maintain is, that every one of us is a continuous individual, one mass of living matter from the crown of the head down to the toes. When I was in Berlin, two years ago, I saw a bowl or vase of enormous dimensions, exhibited in the Berlin Museum. I asked some of my friends why that giant piece of ware, by no means tasteful in its shape, was placed in the museum, and they explained, to my surprise, that it was a single piece of Prussian marble. In this you have an illustration of what I believe to be the correct view as to the structure of the body,—the view that we are one continuous piece of living matter. There are, of course, veins in that marble, and different shades of color, but it is a continuous mass, nevertheless. Imagine such a monster being built up in the shape of a mosaic of millions of small pieces, each piece representing what is called a cell, and you realize the difference between the previous and the present views. The significance of different tissues of the body is entirely based upon the principle of a division of labor, or that of utility.

If you examine a small animalcule, an amœba, with a power of 500 diameters, it will present, in all essential points, the same properties that belong to that fully-developed and most elaborate organism, the human body. There is no question but that the material which builds up the low organisms, such as the amœba, is in every respect identical with that composing our own bodies. It is the great

merit of Max Schultze to have first announced this truth, which has remained unshaken for the last twenty-five years. The living and building material was called "protoplasm" by him, and we still keep up this expression, because we should be loath to apply new Greek and Latin terms to material which, so far as its functions are concerned, remains a puzzle to us. I prefer to term it living matter in general; admitting, however, that it varies in its shape and constitution throughout the different parts of the body, and consequently in its special functions. In the amœba there is no such thing as a division of organs; the animal is merely a little lump of matter of very uniform structure, but nevertheless endowed with sensation and automatic motion; for such an organism will creep about under the microscope to escape obstacles placed in its way. It has, therefore, a certain amount of reason. The little amœba performs the same functions of nutrition and excretion that we ourselves do in general, and exhibits intelligence, only in a lesser degree. Functional action is plain enough; but the question, What makes that little organism move? we cannot answer. Could we but do this, we should also be ready to answer the questions, What are we for? Why do we exist? What are we doing in the world? And what is the purpose of our life? But thus far no answer has been given to any of these questions. All that is within our reach is the study of what we really do observe and comprehend; and all that is embraced in one expression, the morphology of the living matter.

We know that different parts of the living matter within one and the same organism are designed for different purposes and functions; one part—the connective-tissue—for carrying nourishing material, blood and lymph, to form the frame of the body; another part—the muscles—serves for motions; others—the nerve-tissues—for the conduction of motor and sensitive impulses; and a fourth tissue—the epithelia—for protection and secretion. The teeth belong to what we are accustomed to call "connective-tissue," which, speaking of man, forms nearly two-thirds of the whole animal body. It is a widely distributed tissue, of the least significance as regards vitality, but of enormous importance in the building up of the frame or skeleton of the body, the articular ends of the bones, which we call cartilage, and producing a cover all over the body,—that part of the skin which we call derma. This tissue also serves in the shape of teeth for the mastication of food. In fact, what we call dentine is a variety of bone-tissue, and what we know by the term cementum is really bone. The third tissue entering into the construction of the teeth, the enamel, has no kindred in any part of the body; neither do we know its origin. At all events, one thing is sure, that what we call connective-tissue in general is a living tissue. It serves for

carrying nourishing material to different parts of the body, and for holding the nerves and blood-vessels. Most parts of a tooth are destitute of blood-vessels, since these and the nerves are confined to the central portion, the pulp-tissue. Nevertheless, we must admit, after the most careful microscopical and chemical investigations, that the teeth are composed of living tissues.

Thirty-five years ago, when I commenced studying microscopy, I had the good fortune to work in Professor Wedl's laboratory, in Vienna. At that time I considered a tooth a rather dry object; dry, because the teeth were collected in a dry bottle and kept dry; then they were ground dry, or cut into thin slabs and mounted. Since I have been in this country, thanks especially to the kind support from a number of excellent gentlemen of your profession, I have been converted to an entirely different view. To-day a tooth has a perfect fascination to me. I consider a tooth as interesting a subject for study as is, for instance, that most complicated organ, the eye. There is no end to the discoveries and revelations in the teeth, provided you do not examine them in the old-fashioned dry way. Formerly the living matter,—the soft parts,—which invariably consists of a jelly-like albuminous mass, was frittered away and allowed to perish; whereas, we to-day take the greatest pains to preserve that very living matter, the soft portions of the hard tooth-tissues. I do not wish to dwell upon the different methods resorted to for this purpose. It is sufficient to say that our specimens for observation are simply deprived of their lime-salts. We make the thinnest possible sections with a razor or section-cutter, and examine these sections with microscopes of the highest power, just to see where the living matter in the tooth is located, and what are its features in health and disease. Strange to say, this—I do not wish to say novel—idea as to the life of the teeth has not penetrated beyond a number of the best-educated dentists in this country. I was much surprised when, a little over a year ago, a pamphlet was sent to me from a Philadelphia gentleman, bitterly attacking an English dentist for maintaining that a tooth was wholly composed of chalk or lime. Is it possible, I asked, that men are lacking in the capacity of observation to such an extent? I despise a man who sticks to the old-fashioned way, like the peasant who kept a vineyard and made sour wine year after year, although his soil was excellent. A foreigner came to him and said, "My dear fellow, why do you not resort to the new methods of cultivation? You have a good soil for growing grapes that will produce an excellent sweet wine." And the farmer answered, "Why should I? My father and grandfather did it this way; why should I change for another plan?" There is a sort of conservatism among certain people that never will perish, I suppose.

The reason why the new views have obtained a start in this country, while they are so slowly accepted in the old country, is that in the latter there is a great deal of this peculiar conservatism. I ask any intelligent person whether the old-fashioned view, that we are composed of innumerable cells, meets his idea of the construction of the animal body? This question is often raised in my laboratory, and always answered in the negative; whereas, the proposition that we are one continuous mass of living matter should, it would seem, appear reasonable to every one. Does not the whole body work together in harmony throughout? Does not that body react upon an injury done to a toe, or to the pain of an aching tooth?

Division of labor, I said, is the principle upon which the different parts of the body work. This is especially true of the different portions widest apart in their vitality and in their reactive power. If you look at the cartilage-tissue, you will see what they used to call cartilage-cells, and between them the so-called intercellular or basis-substance, which up to our time was considered to be inert. Resorting to the higher powers of the microscope, we can easily satisfy ourselves as to the presence of a delicate reticulum throughout the cartilage-corpuscles and throughout the basis-substance. This reticulum I proved to be the living matter proper. This reticulum is, therefore, the very material that builds up the body; whereas, the liquid contained in the meshes of the reticulum of the protoplasm, in the cartilage-corpuscles, and the glue contained in the meshes of the basis-substance, are inert. I admit that heretofore the structure of the tissues was not easily demonstrated. It takes a certain amount of education of the eye to see all these minutiæ. But after a little training of the eye, and by the treatment of the cartilage with absolute alcohol, which renders the connections of the cartilage-corpuscles easily visible, they can be seen by all, notwithstanding the difficulties to be overcome. I am happy to say that a couple of months ago I came into possession of a beautiful and rather expensive machine, which was made in Vienna for me, and is an invention of Professor Stricker. It is a so-called electric picture-microscope. The instrument was brought by Dr. Gartner, one of Professor Stricker's assistants. I have already made a great many trials with this instrument, and the result is that all the structural minutiæ can now be demonstrated to 400 or 500 persons simultaneously without the least difficulty. I have not yet succeeded in obtaining a suitable amphitheater where exhibitions can be given with this instrument to a large audience. Another difficulty has been that we could not procure carbons of a proper size. As soon as we receive proper carbons, and can dispose of 3500 candle-light, the demonstrations will begin. We have obtained perfect images at short distances of

about half a yard, and when the electricity is increased to forty amperes (the light burning in Fifth avenue is ten amperes), I shall be able to show to hundreds of people at once the details referred to. This is the aim of my life, and when it shall have been accomplished I do not wish to do much more in this department.

I may say that the laziest tissue in the human body is the cartilage. It consists of a reticulum of living matter partly free in the cartilage-corpuscles, partly buried in the basis-substance. The most active tissue, on the contrary, is the nerve-tissue. Here again is a continuous mass of living matter, starting from the brain and running as nerve-fibers throughout the whole length of the body. Between these two in point of activity stands the tissue that we call dentine. Here we see, at the outer periphery, which Dr. Atkinson has aptly termed the interzonal layer, protoplasmic bodies between the enamel and the dentine. We know that these are in connection with the pulp-tissue by means of fine threads of living matter, the so-called dentinal fibers.

Here are three tissues as samples, and if you realize that living matter is present in every one of them, the question necessarily arises, How is it that this living matter will behave so differently in different tissues? The answer is to my mind plain enough. The cartilage-corpuscles are surrounded by a comparatively tough and dense basis-substance. In the nerve-tissue there is no such obstacle. The living matter in the centre of the organism is directly connected with the living matter in the peripheral parts of the body through the medium of the living matter that we call nerves. In a tooth there are similar characteristics. The enamel-tissue at the periphery is directly connected by delicate threads of living matter with that in the pulp-chamber. The action of living matter, therefore, necessarily differs in its manifestations in cartilage, in nerve, and in tooth-tissue. In the former the action is confined to a very small place, perhaps to a single corpuscle. Suppose an impulse, resulting in the contraction of the living reticulum, starts in a single cartilage-corpuscle, what will be the effect? This impulse has to pass through the dense, tough basis-substance; therefore the conduction must be a very slow one. Nevertheless, do not imagine that cartilage is an absolutely inert tissue. In 1872 I burned with a hot iron the cartilage of the knee-joint of a dog. Eight days afterwards, when the animal was killed, I found, very much to my surprise, a brown discoloration in the cartilage,—not in the immediate vicinity of the place where the hot iron was applied, but one or two millimeters away, forming a brown ring around the original burn. An examination with the microscope proved that the charcoal particles which produced the discoloration were deposited in the comparatively

healthy and otherwise unchanged cartilage-corpuscles. The coal particles, it is evident, were transported through the threads of living matter, traversing the basis-substance into the neighboring cartilage-corpuscles. These proved to be cannibals, for they had eaten the remnants of their own brothers. If a cartilage-corpuscle be irritated, the impulse will perhaps be carried a short distance only. If such a cartilage-corpuscle could think and talk in a popular way, what would be likely to follow? It would send a message for assistance to its neighbors, telling them, "I am injured; I want you to help me." When that appeal for help comes to the neighbor through the dense basis-substance, the voice is scarcely heard, and the neighbor perhaps asks, "What did you say?" The fellow will shout again, "Help!" The neighbor will answer, "Let me alone; I like to sleep; if you are hurt, defend yourself." Even after such a severe injury as that produced by the application of a hot iron, no inflammatory reaction will follow in the cartilage.

Widely different is the case with the ganglionic bodies and nerve-tissue. Here everything, from the first moment of conception to the last breath, is continuous motion and change. Even while we are asleep the nerve-tissue has to do its work, for it controls the action of the heart and the movements of the muscles in respiration. If I apply a hot iron to my skin, or let a burning cigar-leaf fall upon my hand, the protoplasm in the periphery of my body telegraphs at once through the nerves to my brain that something is wrong. This message is carried like lightning to the center of sensation first; this immediately telegraphs to the center of motion, and the latter telegraphs back to the muscles. The result is, that I quickly remove that burning leaf, or do something to get rid of the obnoxious object. All that is reflex action, and is performed with great rapidity. If an injury is done to the body, the nervous system helps us to get rid of the offending object and puts us in the way of defence. At the same time the injured protoplasm will produce a reaction for the purpose of healing up the damage, resulting in what we call inflammation. The scar left after an injury is the result of the inflammation that nature sets up in trying to heal the wound made by the burning cinder.

Taking the third tissue, the dentine, there is something very similar in its reaction. When you bore a hole into a tooth, so long as you work in the enamel the reaction is not very great; but when you reach the interzonal layer the protoplasmic bodies immediately send a message for help. They telegraph at once to their neighbors, "We are injured, come and help us;" from there the message is carried to the centers of sensation and motion, and assistance comes immediately. The man kicks, and tries to remove the hand of the

dentist. Not only in the interzonal layer, but about the neck of the tooth, is found a greater proportion of living matter than in other parts of the dentine. Should inflammation set in, which means an effort of nature to heal up the damage done, it will be manifested not only in the immediate neighborhood, but the reaction will extend further, and we get inflammation in the pulp of the tooth. Inflammation, so long as it runs within certain limits, is in many respects beneficial. It leads to the production of embryonal tissue; afterwards of newly-formed dentine, which, though not as perfect as primary dentine, serves at least as a protection against new damage. If the injury is very deep, then woe to the man; pulpitis will set in, accompanied by terrible pains, the reaction being intense and injurious. We know that if a gun-ball is lodged in an elephant's tusk there is a very extensive reaction around it. The gun-ball is a foreign body, and if it remains in the elephant's tusk for a sufficient length of time the dentine immediately surrounding it will present an appearance entirely different from the original or primary dentine. It is not translucent; has not the same consistence and elasticity that belong to primary dentine. This remarkable phenomenon was first studied, in the last century, by the celebrated German philospher Goethe. He, in his curious way, called this reaction condensation of the dentine; and one hundred years later we are not much further advanced than that. But we know to-day that the tissue formed around the gun-ball in the elephant's tusk is the result of inflammation in the dentine itself; that this process first returned the tissue to its embryonal condition, as is the rule with all inflammatory processes, and then produced a new tissue, different from the original, but hard and brittle, forming a kind of protection for the normal dentine in the neighborhood of the gun-ball. Even a name for the process of inflammation of the dentine is as yet lacking. Dr. Bödecker has suggested the term "eburnitis," or inflammation of ivory, and I do not know of any better. This inflammation may be beneficial if it is brought to bear upon a foreign body in a limited degree only, or it may be very detrimental if it is extensive and carried very far down into the pulp-tissue, causing reaction and so-called pulpitis.

At last I have reached the topic that I wish to dwell upon. Looking over a large number of specimens of teeth, and examining both the dentine and the enamel, we are struck at once by the fact that the caliber or breadth of the dentinal canaliculi varies greatly in different teeth. In the first place, the temporary teeth have very much wider canaliculi than those of adults, and, necessarily, there is more living matter in the former ones. Secondly, we see that the dentine of persons whom we are accustomed to consider

rather sickly and weakly, pale-looking individuals, as a rule has wider canaliculi, with more living matter and less lime-salts, than is found in the teeth of robust and strong persons. Quite recently Dr. Abbott has made in my laboratory some studies concerning the minute structure of the enamel in its pathological bearings upon the question of caries, and I was perfectly amazed on seeing the beautiful structure-changes exhibited in a great variety of specimens of the enamel. This investigation shows what an important factor the structure of the enamel is in the problem of caries and its pathology.

Let us bear in mind one thing, that the more living matter there is present in a certain tooth the less are its lime-salts, and the greater the probability of any irritation being extended down to the pulp-chamber, simply because the dentinal canaliculi are wider and contain more living matter, and the conduction will be quicker than in cases where the canaliculi are narrow and the fibers of living matter very thin, the deposit of lime-salts or basis-substance being greater. But do not imagine, gentlemen, that the deposit of lime-salts in the teeth is unchangeable, even in the adult. It happened to myself two years ago, after a terrible ordeal in my family, the loss of a beloved child,—I being broken down bodily and mentally,—that my teeth, which were pretty strong naturally, became so soft that Dr. Bödecker in working upon them could tell the difference at once. I do not question the assertion of expert and observing dentists, who claim that it is possible from working upon the teeth of a lady to diagnose the condition of her uterus,—whether it is healthy or not,—because sickly persons cannot have as much lime-salts as the strong and healthy. This the dentist will notice at once, his sense of touch being so delicate from working upon so many different teeth. This fact shows, therefore, that the teeth are under the control of general nutrition, and that if there had been originally present a great amount of lime-salts in a person's teeth, and comparatively small threads of living matter, under certain circumstances the lime-salts may be dissolved out and the dentine softened down in a comparatively short time. How much more soft and imperfect are the teeth of persons who were sickly or not properly nourished while the teeth were forming, and where there has not been originally a proper deposit of lime-salts! To be sure, the soft material of such teeth is easily accessible to decay, and reacts upon the least irritation.

What can we learn from these observations under the microscope concerning reaction in teeth? In the first place, we find out the degree of consistence of the dentine. Should you notice that the dentine upon which you work is lacking in lime-salts, you must, I think, subject such teeth to an entirely different treatment from

that which you might employ upon teeth well supplied with lime-salts. If you have to deal with temporary teeth, which hold less lime-salts than the teeth of adults, and far more living matter, I should say, speaking from theory, that you cannot work with the same material upon them that you can upon teeth of adults. If you do so, the punishment will come very soon. A material which, if placed in the tooth of an adult, produces but comparatively little reaction, or eburnitis, if placed in the tooth of a child, will be very likely to cause intense irritation and severe inflammation, extending to the pulp-chamber and resulting in pulpitis.

The example to which I called your attention, the elephant's tusk with the gun-ball in it, serves as an illustration of the effect of all fillings that are inserted in teeth, for every filling of a tooth is a foreign body, and as such must necessarily produce more or less reaction. This reaction will be beneficial if it results, as in the case of the gun-ball in the elephant's tusk, in establishing a protection to the neighboring dentine by forming a wall around the foreign body; but if the reaction be too intense, and goes too far down into the pulp-tissue, it will be very detrimental. When I saw these features under the microscope, I began to understand why gold fillings are no longer recommended for temporary teeth, or at least are not resorted to as often as they were a few years back. Gold fillings are, to be sure, good in their place; but I doubt whether gold is a proper filling for temporary teeth, for the reason that the material is so heavy, and the force to be applied in putting it in is too great for the temporary teeth. I believe that two or three years ago I had the pleasure of mentioning before a number of gentlemen of your profession the fact that my researches had led me to conclude that gold fillings were not the best fillings to be placed in temporary teeth, and I was informed during the last season by a number of dentists that they have given up the use of gold for temporary teeth almost entirely. I think you will also find when operating upon the teeth of pale, puny, sickly individuals, that the dentine is softer than it ought to be. If this be the case, do you not think it would be a wise plan to adopt a filling material which would produce the least injury to the neighborhood of the cavity? Of course, you can excite inflammation artificially and purposely before putting in the filling, by applying a caustic of some description which will produce inflammatory reaction, leading to eburnitis and consolidation of the dentine, and then on top of that you might put your filling,—a plan that I am told is largely adopted by your profession. The cavity is first filled with some caustic that produces inflammation, and forms a hard wall around the cavity; and after the lapse of a few months or years this provisional filling is taken out and replaced with a

gold filling. It is a wise plan, I should say, in cases where there are lime-salts enough to produce active inflammation; but I can realize that in many instances such treatment might produce too extensive inflammation and pain, which might necessitate the removal of the tooth.

I have observed that the teeth, though built up upon one and the same general plan, yet show innumerable varieties in the details of this plan. It was first observed that temporary teeth have wider canaliculi, and more living matter and less lime-salts, than teeth of adults. Next we come to settle the fact that the teeth of strong and healthy persons have more lime-salts and less living matter than those of persons in a sickly and run-down bodily condition. These facts established, we must arrive at the conclusion that it is not a wise plan to apply one and the same method of treatment to all kinds of teeth. You should be judicious in the choice of your method of filling teeth. There are teeth which need the most gentle treatment and the mildest filling material. In a general way the temporary teeth belong to this class, and also the teeth of persons who are in poor general health; whereas, in the cases of strong and robust adults, you can risk the use of almost anything without danger of inducing very severe reaction. Fortunately for the dentist and for his patient, such irritation sometimes leads to the formation of secondary dentine. Is it not perfectly marvellous to see that an operation upon a tooth which extends very near to the pulp-tissue is attended by a reaction which leads to the formation of new dentine,—namely, a protective wall against new injuries; and if the dentist is lucky enough to work upon the tooth after the secondary dentine is formed, his chances are better than if he worked upon the tooth before such secondary formation had taken place, and when he would be likely to reach the pulp-chamber.

These are merely general outlines of what I have learned from the microscope concerning the practice of dentistry. I do not claim any merit for them; but what I claim is that the microscope will, even to an unpracticed mind, open new views and widen the field of mental vision; will broaden our views in general, and help us to be successful in practical work. It has been my good fortune to be supported in a very handsome manner by many gentlemen of your profession; and I can almost boast of the success of my laboratory among dentists. If you ask why that is, the answer is plain enough, for, so far as I have seen, the art and science of dentistry is far more advanced in America than in any other country, and the desire to look into things a little deeper, to learn how the material upon which you work is constructed and to deduce conclusions from such

studies, is far more developed in this country than anywhere else. Considering the difference between the previous methods of grinding specimens and that which we adopt, we should not be surprised to see that there is a greater interest in such studies in this country and better results obtained than elsewhere. To maintain that progress in dentistry, and in knowledge of the anatomy of the teeth, is possible only upon the ground I have taken,—namely, that the teeth are altogether composed of living tissues which react upon irritation. That man is the best and most successful dentist who knows how the tissue upon which he works is constructed, and who can estimate the degree of its reaction upon his work.

Dr. Atkinson. It is a pity we should not be better able to manifest our interest in a subject that lies at the very foundation of our fitness to do our daily duty. That the question is of transcendent importance to every man who undertakes the responsibility of dealing with the teeth in their pathological condition, I am as well convinced as I am of the moral obligation resting upon me in any instance whatever. It is evident that we have been doing our work under some sort of mental grip of the principles that were involved in what we were doing, but without sufficiently scrutinizing our own processes, or keeping them in our minds, so that we might afterwards be able to repeat the mental process through which we went in making up our decision as to what was the matter and what was best to be done in any particular case; and until we can do this we will be reaching after the unknown. As it has been clearly stated in the lecture, we did not know the full significance of the enamel, and we did not understand the power by which the organism was built up. We had regarded Prof. Heitzmann as rather materialistic in his views, but to-night he has shown the importance of the energy that moves us mentally and bodily, and solves the problem of the differentiation under which he says nutrient acts take place.

Dr. Frank Abbott. Prof. Heitzmann, in speaking of the bullet in an elephant's tusk and the manner in which the tissue surrounding the bullet is changed and hardened as a protection against the foreign body, failed to state that the dentine in the tusk of an elephant and the dentine of a human tooth are almost identical in structure,—so nearly alike that if specimens of each be examined under the microscope it is difficult if not impossible to tell one from the other. The bullet in this instance is an irritant, and the resulting irritation causes a flow from the canaliculi of the dentine, which becomes calcified around the bullet, encysting it there so thoroughly that it remains in the tusk perhaps a hundred or more years, in some instances, without inconvenience to the animal. That which causes

the decay of a tooth is itself an irritant, and the same condition of things is here produced in a measure as by the lodgment of a foreign body in the elephant's tusk, only in a different manner. If you cut out such a cavity and fill it with gold, you have, to all intents and purposes, a bullet in the tooth surrounded by tissue in more or less of an inflammatory condition. This inflammation has produced a dislodgment of the lime-salts of the dentine at varying distances around the cavity thus filled, which, when the irritant cause is cut off by the filling, re-arrange themselves. The filling thus becomes encysted somewhat after the manner of the bullet in the elephant's tusk. This inflamed portion of the tooth will not form as perfectly as originally, but into a more solid tissue, which is more difficult to cut with an instrument. This you may have observed when removing a filling that has been in a tooth for some years. You find the bottom of the cavity under the filling black or brown; you are satisfied that it has been protected from moisture; that no actual discoloration has taken place since the filling was inserted, and that therefore it must have been there before the tooth was filled. The dentine in such cases becomes recalcified or reorganized. There is a practical lesson for us here by which we may understand something of what the doctor has been telling us.

Dr. Atkinson. Instruction which does not instruct does not suit me. There is a great deal to be read between the lines after you apprehend and comprehend a statement, when you reproduce it on another occasion. Filling the cavity of decay in a human tooth is not analogous to the process through which the elephant's tusk has gone after being wounded by a bullet. The ball would have to enter the pulp proper, either at the junction of the formed dentine and the pulp, or into that which has not been calcified, to lay a foundation for the encystment of the ball in the irregular formation of dentine which differentiates this part of the ivory from that formed in a normal manner. It is near the pulp that the embryonal matter is secreted in sufficient quantity to be converted into a cyst that would inclose the ball. The consolidation of tissue that has been referred to by Prof. Abbott takes place, as Prof. Heitzmann told you, through a retrogressive movement. Prof. Abbott said there was a decalcification of the lime-salts. It is not a decalcification. It is a solution or melting of the lime-salts between the tubuli. All the lime is there. When it becomes reconsolidated we have irregular fascicles of fibrils, like bunches of grass tied in the middle, and this differentiates them from the regular formation. It occurs in every case that there is a considerable territory which is not invaded by the retrogressive process that is called decay, whether in the enamel or the dentine. And when you talk about the difference

between enamel and dentine you should remember that it is a difference in degree but not in kind. If there is a man who denies that, let him say it now or forever after hold his peace. And if there is any man who does deny it, I will give him a Delmonico dinner when he substantiates his denial.

Dr. Abbott. Like my friend Dr. Atkinson, I dislike false teaching and admire correct teaching. He has told you that there is no such thing as decalcification in teeth. That there is in a decaying tooth a portion of the affected territory that has as much lime-salts as it had originally I do not dispute at all, but there is a portion outside of that where the lime-salts have been taken away, and to a considerable extent, too. Prof. Mayr, of Springfield, proved this by experiments. He cut into the cavity of a tooth a certain distance and found a little lime-salts; he removed a deeper layer and found more; then he cut still deeper and found still more, until he came to perfect dentine in the layer adjoining with the normal quantity of lime-salts. But there is no absolute line of demarkation set up, on one side of which you can expect to find absolute perfection, and on the other side absolute imperfection, of dentine. The disturbance that occurs in the decay of a tooth is so penetrating, and works in so insidious a manner, that much more of the tooth-substance is affected (although it may be but slightly) than that which we take away before filling, and that incipient disintegration can never be detected except under the microscope. A considerable portion of this affected dentine which is left in the bottom of the cavity contains a large amount of lime-salts, possibly the normal quantity, only it is disarranged; and in a great many instances the reconsolidation is simply the rearranging of the lime-salts; but there are many instances where a redeposit of lime-salts has taken place, being brought into the locality through the dentinal canaliculi.

Dr. Atkinson. I cannot stand that. It does not do for us to shift our position as the gentleman has done. He has spoken truthfully every word that he has said, until he came to the point of applying them to cases where reconsolidation occurs. Reconsolidation occurs wherever an irritation and the formation of acid is arrested. Then the nutrient current spontaneously reconsolidates the tissue, sometimes in a regular and sometimes in an irregular manner. There is no machinery that will bring the lime-salts from a distance in any sufficient quantity to produce this reconsolidation after decalcification has occurred. It can only be brought in an infinitesimal proportion, entirely inadequate to solidify the whole territory, as is often seen. It is through a retrogressive metamorphosis that decay was brought about. Prof. Heitzmann said a current; he did not say of what, but he said there was something that did the work.

He did not say it was spirit. He did not say the liver secretes bile, but he intimated that bile was secreted in the liver. Like a wise philosopher, he dodged the point and did not call it a cause. When these arrested currents return we get a rebuilding exactly after the manner of the original structure, where the circumstances will admit of it; and where the circumstances do not enable the nutrient activity to behave in its old-fashioned, habitual method, then it accepts its second choice of morphologic character, and the basis-substance predominates over the tubular structure. We sometimes take less, rather than not settle the bill; and they take less of the morphological energy by which these currents effect their purpose. I have seen fractured sockets, or dislocated teeth, so loose that the great mass of surgeons and dentists would advise their removal. Their looseness was caused by a retrogression of the bony tissue of the surrounding parts. The lime-salts being melted, made them so loose as to seem incapable of restoration. But don't remove them. The elements of the bone are all there, and upon being secured in place, so that they will not be disturbed unduly by the occlusion in mastication, the tissues will be reproduced so finely as to defy detection by the sharpest scrutiny. I have seen them in five days so perfectly restored as to make me marvel at the rapidity of the result, and I too would have denied that it was possible that they had been as loose as I had seen them five days before.

Adjourned.

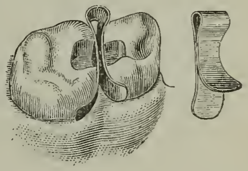
B. C. NASH, D.D.S., *Secretary.*

PENNSYLVANIA ASSOCIATION OF DENTAL SURGEONS.

AT the annual meeting of the Pennsylvania Association of Dental Surgeons, held on the evening of October 13, 1885, the following were elected officers:

W. H. Roop, president; T. W. Buckingham, vice-president; Theodore F. Chupein, corresponding and recording secretary and reporter; W. H. Trueman, treasurer and librarian.

FIG. 1.



Dr. W. H. Trueman presented for examination a matrix invented by Dr. Miller, of Altoona, Pa., designed to assist in filling approximal cavities of molars and bicuspids. It is made of steel, rolled thin, and shaped like the "spring cotters" used by machinists. The strip of steel, about an eighth of an inch wide, is bent so as to bring the ends together, the bend being formed into a circle, as shown in the cut (Fig. 1). It is used by placing it between the teeth to be filled, first

springing it apart so that it will exert sufficient pressure against the teeth to hold it in place. It is thus self-sustaining, and may be relied upon for plastic fillings with no other support. When gold is used, a wedge of wood is inserted between the ends, so shaped that it will press the lower edges of the matrix against the cervical border of the cavity. Little ears may be formed upon the upper edge to prevent it pressing into the gum. It is a simple affair, easily made, and promises to be useful in a variety of cases.

Dr. Trueman also presented several models upon which plate teeth had been mounted as pivot teeth, and gave the method used in taking the impressions from which they were made. In preparing the roots for this operation, he so shaped them that, while the labial or buccal margin was sufficiently low to allow the gum to well cover the joint between the root and the tooth, the palatal margin remained about a sixteenth of an inch above the gum. Around this portion he fitted a collar, embracing about three-fourths of the circumference of the root, and extending slightly below the free margin of the gum. The wedge-shaped pivots he made of heavy plate, passing them as far into the root as the condition it was in would permit. With a small bur in the dental engine he enlarged the pulp-canal, making it oblong, to suit the shape of the pivot, which was accurately fitted therein. If he had time, he preferred to fit the plate over the root in the mouth, after punching a hole for the pivot, and, while they were in position in the mouth, fastened together the plate and pivot with adhesive wax. They were then carefully removed and soldered. Placing it again in position on the root, he carefully fitted the plate with a burnisher, and afterwards trimmed it to the right size; then placing the collar in position, he built about them sufficient plaster to securely hold them together. When the plaster was hard they were removed, invested, and soldered. It takes a little more time to thus do the work, but the result is most satisfactory. He then places the fixture on the root, and proceeds to take an impression by building plaster over the root, and over one or two teeth on each side. This is allowed to get quite hard, and is then carfully removed. Impressions taken in this way frequently break up, but they can generally be put together again accurately. After the model had been made, and before the plate and pivot had been disturbed, the model was hollowed out on the under side until the point of the pivot was just seen. The object of this was two-fold: first, as a ready means of removing the fixture from the model by pushing the pivot with a blunt point after the tooth had been waxed on; and, secondly, as a means of getting the pivot the right length in cases where he did not solder the plate and pivot together before taking the impression. When hurried, he fitted the

pivot and collar, placed them in position, and took the impression; completing the fixture by the model. With care this answered very well, and took much less office time, but the result was not so satisfory as by the other plan. In these cases accuracy was very important. If the finished case did not go in right, or nearly so, it was a waste of time to attempt to make it do so. He used gutta-percha to secure them in the roots, preferring that to any other material.

Dr. Trueman also exhibited a molar crown of the Bonwill pattern which a patient had brought to him. It had been in place perhaps two or three years. The patient said that, a few days after it had been placed in position, the root and the gum back of it became quite sore. The dentist who inserted it examined it several times, but was unable to find any cause, and supposed it to be due to the irritation of the root. He had examined it a few months ago carefully; the gum then was very much inflamed, but he discovered nothing wrong, and thought the inflammation was caused by a very much broken-down root just back of it. When the crown came off there was no difficulty in accounting for the trouble, as will be seen on examining the crown. There was a large mass of amalgam which, when the tooth had been placed in position, had pressed out, extending nearly three-fourths around the crown, and which was so completely buried under the gum that it was impossible to see it, and Dr. Trueman thought it would have been equally impossible to have removed it after it had hardened without removing the crown (see Fig. 2). The case was one of unusual difficulty; the mouth was small, the cheeks massive, the tooth far back in the mouth, with a long tooth immediately in front of it, and the root so shaped that at several points there was considerable space that had to be filled with amalgam. It was impossible to make the crown fit the root all around. To his mind it was a case that illustrated very plainly two things: First, the unsuitableness of amalgam for the purpose of securing pivot teeth or crowns in position. Gutta-percha might have been removed without disturbing the crown; amalgam could not. Second, the importance and *justice* of being very slow to find fault with another's work. Knowing nothing more of the case than is shown by this molar crown, with the rough, ragged mass of amalgam attached to it, you might well call it an abominable piece of botch-work. Could you see the mouth, the position of the case, and the difficulties encountered in arranging it, you would, I think, agree with me in saying that its failure was no reflection upon the skill or carefulness of the operator, but was due to one of those "grape skins" we occasionally meet with in the path of life that no care or skill can *always* avoid.

Fig. 2.

THEODORE F. CHUPEIN, D.D.S., *Reporter*.

MARYLAND STATE DENTAL ASSOCIATION.

THE third annual meeting of the Maryland State Dental Association will be held at the southwest corner of Charles and Lexington streets, Baltimore, Md., on January 8, 1886, at 8 P.M.

WM. A. MILLS, *Corresponding Secretary*,
49 So. Broadway, Baltimore, Md.

EDITORIAL.

THE INTERNATIONAL MEDICAL CONGRESS.

IT may be assumed that there are few engaged in the practice of medicine or dentistry but have learned of the proposed session of the International Medical Congress in Washington, in September, 1887; and it may also be assumed that it is almost universally known that inharmony, dissensions, even bitter antagonism, have been developed in the ranks of medical practitioners,—an inharmony which seriously threatens, if indeed it does not insure, a partial and possibly a complete failure of the project.

It is scarcely worth while to occupy space in the attempt to explain the causes which have led to this much to be regretted state of things. The complications are such that it would be difficult, if not impossible, to present a résumé which would not provoke controversy. Suffice it to say that the the differences seem to be irreconcilable, and a restoration of harmony, although confidently predicted, highly improbable.

The preliminary organization of the Congress included a Section of Dental and Oral Surgery, which after some vicissitudes was finally embraced in the permanent arrangements for the session. This result was not arrived at, however, without some elements of discord entering into the discussions; but of these again it is not necessary to speak. Nor could a statement of the causes producing this inharmony be framed which would not be considered partisan.

Passing by, therefore, all causes and matters of discontent, the question to be determined promptly and definitely is, whether under existing circumstances it is expedient to continue the effort for perfecting the organization of the Dental Section of the International Medical Congress of 1887.

The interval before the time assigned for the meeting is already so brief as to require prompt and harmonious action for a creditable presentation of dental science and art, and anything less than creditable would be emphatically *dis*creditable.

Two courses are open,—either the work should be taken hold of promptly, heartily, and unitedly, or it should be at once and definitely abandoned.

The first problem is, will the medical profession so adjust its differences as to give reasonable assurance of the success of the Congress as a whole?

The next point to be settled is, will a sufficient number of leading men in dental practice combine to make a worthy presentation of the specialty?

There is one view to be taken of the situation deserving consideration. The great majority of the practitioners of dentistry are not medical men in the usual sense of the term. Forming in their affiliations and organizations a really distinct and separate body, it is competent for them to make a brilliant success of their Section which would be all the more luminous by contrast if the Congress as a whole should prove a failure.

But whatever is done should be done at once. Every dental society should take the first opportunity to record its decision in the dental journals, and thus a consensus of professional opinion could be had which would satisfactorily determine whether concerted action on the part of the dentists could be secured.

We would heartily favor the Dental Section provided it should have the united support of the leaders of dental thought. But with the influence of these thrown against the project, it would be worse than useless to hope for satisfactory results.

As an unbiased recorder of facts, the DENTAL COSMOS is forced to the statement that, "under existing circumstances," the majority of the profession apparently deem it inexpedient to continue the effort for perfecting the organization of a Dental Section of the International Medical Congress. Such was the purport of a resolution adopted without a dissenting voice at an informal conference of some twenty leading dental practitioners at Buffalo, in November. At the recent anniversary of the First District Dental Society of New York the opportunity afforded at an entertainment given to the guests from other cities was availed of to take an informal vote on the question of "expediency." Out of about forty present, there were but two votes in favor of co-operation.

While like sentiments are expressed in private correspondence from all parts of the country, it is only fair to say that the current of opinion is not all in one direction. There are those who think the situation promising, and who express unlimited confidence in the success of the Congress as a whole and in the Dental Section as a part.

It is due to those who have accepted position in the Congress that they be not left in doubt as to the intentions of the profession a day more than is necessary.

THE FIRST DISTRICT DENTAL SOCIETY'S ANNIVERSARY.

The gathering of distinguished men with which the First District Dental Society of the State of New York celebrated its seventeenth anniversary was one of the most notable events in the recent history of dentistry. The Executive Committee of the society is to be congratulated on the successful outcome of its efforts to arrange a meeting which should have due regard to social amenities and also provide for those in attendance a rare intellectual entertainment.

The programme was not an attempt to cover the entire field of theory and practice, the committee wisely deciding that the exhaustive presentation of a single subject would be a more valuable contribution to dental literature than a perfunctory and superficial disputation upon a round of topics. The subject chosen was "The Development and Minute Anatomy of the Teeth in Health and Disease," to the discussion of which nearly all the gentlemen in the profession who have made original research or special study in this direction were invited. The meeting was not in any sense a "mutual admiration society." Two directly contrary theories were presented, each by its ablest exponents. The debates were, in consequence, earnest and the ground vigorously contested.

The bioplasson theory of morphological structure, of which Prof. Carl Heitzmann is the author, in its application to the teeth has of late years obtained wider credence among dentists than any other, because it has been looked upon as explaining many things not readily brought into agreement with theories previously offered. Briefly stated, Prof. Heitzmann's theory is that the living matter of the animal organism extends through every part of it in the form of a continuous net-work or reticulum. In the light of this theory the hard tissues of the teeth are to be considered as pervaded by the reticulum of living matter, the dentine and enamel being formed or built up by the calcification of successive layers of corpuscles. Caries is the unbuilding or retrograde metamorphosis of these layers, characterized by their liquefaction and decalcification and return to the medullary elements from which they were formed. This explanation of the process of caries, first announced by Prof. Frank Abbott, has come to be known as the "inflammation" theory, because of the claimed similarity to inflammation of bone (osteitis).

An elaborate paper was read by Dr. J. L. Williams, of Philadelphia, combating the doctrines above stated. Dr. Williams's view, based upon careful study, under the microscope, of the process of development, is that the enamel and dentine are not built up in the way described by Prof. Heitzmann and his colleagues, but are formed by the secretion of a cartilaginous matrix and the almost simultaneous deposit in it of the mineral elements; that, therefore,

if the process of decay is a return to the embryonal condition through the stages passed in development, in reverse order, there can be no such appearances as have been described and illustrated.

In the enforcement of his position Dr. Williams had the co-operation of Dr. Will X. Sudduth, of Philadelphia; Prof. R. R. Andrews, of Boston; Prof. G. V. Black, of Jacksonville, Ill., and Prof. C. N. Peirce, of Philadelphia. Prof. Heitzmann was ably seconded by Prof. Abbott, who opened the discussion, and by Drs. C. F. W. Bödecker and W. H. Atkinson, of New York.

The papers and a full report of the discussion are promised for an early number of the Dental Cosmos.

The subject, while not usually regarded as within the domain of practical dentistry, is nevertheless of the highest importance to every practicing dentist. So long as the method of development and the progress of caries are enshrouded in mystery, prophylactic and therapeutic measures can be only empirical. A conclusive demonstration of the course of development points unerringly to the path which disintegration must pursue. With these known, it were a comparatively easy task to determine whether any system of prophylaxis will fortify the teeth against the attacks of decay, and, if yea, what steps promise the best results; and, further, whether any remedial measures other than mechanical can be of value in the treatment of caries.

Towards the solution of the questions involved we feel sure the meeting of the 9th of December will contribute in no small degree, by awakening interest and stimulating investigation.

This is not the first time the First District Dental Society has earned the thanks of every member of the profession by its efforts to advance the vital interests of dentistry. It has long been in the foremost rank of the most progressive local societies, and furnishes an example which may be imitated with profit by dental societies and associations everywhere.

The invited guests from a distance certainly had no occasion to complain of the provision made for their entertainment—the supper was all that could have been desired.

PHOSPHORIC ACID IN DENTAL CARIES.

At the request of Dr. E. S. Niles, of Boston, we made the announcement in the December number of the Dental Cosmos that we would publish in the January issue an illustrated paper in demonstration of his theory that free phosphoric acid is the principal factor in dental caries.

Having subsequently learned that Dr. Niles had furnished a copy

of his paper to another journal for publication without intimation of that fact to us previous to the announcement referred to, we were compelled under the rule which obtains with all well-conducted journals forbidding the simultaneous publication elsewhere of a paper furnished as original matter, to decline its publication.

GEORGIA DENTAL LAW.

We published in the DENTAL COSMOS for November, 1872, page 628, the act to regulate the practice of dentistry in the State of Georgia, which act was approved August 24 of that year.

An amendment to that act was passed by the General Assembly, and approved October 20, 1879, as follows:

SECTION 1. *Be it enacted by the General Assembly*, That section 1416 of the code of Georgia be so amended as to read as follows: "That any person who shall, in violation of this act, practice dentistry in the State of Georgia for a fee or reward shall be deemed guilty of a misdemeanor, and upon conviction shall be punished as prescribed in section 4310 of the code of 1873; provided, that nothing in this act shall be construed to prevent any person from extracting teeth; and provided further, that none of the provisions of this act shall apply to regular licensed physicians and surgeons in practice at or prior to the passage of this act, and dentists who were in practice prior to the 24th of August, 1872."

SEC. 2. Every person practicing dentistry in this State shall, within sixty days after the passage of this act, register his name, together with his post-office and the date of his diploma or license, in the office of the clerk of the superior court of the county in which he practices, and shall, on the payment to such clerk of a fee of fifty cents, be entitled to receive from him a certificate of such registration.

SEC. 3. That all laws and parts of laws in conflict with this act be and the same are hereby repealed.

A further amendment was passed, and approved October 9, 1885, of which the following is the text:

SECTION 1. *Be it enacted by the General Assembly*, That from and after the passage of this act it shall be unlawful for any person to engage in the practice of dentistry in the State of Georgia, unless said person *shall have obtained a license from a board of dentists duly authorized and appointed under the provisions of this chapter to issue license.*

SEC 2. That the board of examiners shall consist of five (5) dental graduates or practitioners of dentistry, who are members in good standing of the Georgia State Dental Society; provided, that said graduates or practitioners have been practicing in the State of Georgia for a term of not less than three (3) years. Said board shall be elected to serve for two years. The president of said Georgia State Dental Society shall have power to fill all vacancies in said board for unexpired terms.

SEC. 3. That it shall be the duty of this board: First, to meet annually at the time of meeting of the Georgia State Dental Society, or oftener at the call of any three members of said board. Thirty days' notice must be given of the annual meetings. Secondly, to prescribe a course of reading for those who study dentistry

under private instruction. *Thirdly, to grant license to all applicants who undergo a satisfactory examination. Fourthly, to keep a book, in which shall be registered the names of all persons licensed to practice dentistry in the State of Georgia.*

Sec. 4. That the book so kept shall be a book of record, and a transcript from it, certified to by the officer who has it in keeping, with the common seal, shall be evidence in any court in the State.

Sec. 5. That three members of said board shall constitute a quorum for the transaction of business, and should a quorum not be present on the day appointed for their meeting, those present may adjourn from day to day until a quorum is present.

Sec. 6. That one member of said board may grant a license to an applicant to practice until the next regular meeting of the board, when he shall report the fact, at which time the temporary license shall expire, but such temporary license shall not be granted by a member of the board after the board has rejected the applicant.

BIBLIOGRAPHICAL.

Diagnostik der Zahnkrankheiten und der durch Zahnleiden bedingten Kieferkrankungen. Nebst einem Anhange ueber die Differentialdiagnose von Zahn- und Augen- als auch Ohrenkrankheiten. Von Dr. Josef Arkövy, Docent der Zahnheilkunde a. d. Universität in Budapest. Verlag von Ferdinand Enke, Stuttgart, 1885.

This work, as its title implies, is a diagnosis of diseases of the teeth,—confined, however, entirely to pathological conditions of the pulp, pericementum, and deciduous teeth, as far as the author, Dr. Arkövy, is concerned; but an addition is given by Dr. Georg Creniceanu on differential diagnosis of the diseases of the teeth in relation to diseases of the eye, and also one by Dr. Julius Böke, professor of diseases of the ear in Budapest.

The author devotes 348 pages to the consideration of the pathological presentations of those two important organs, the pulp and pericementum; but enters so much into the minutiæ of things that one is lost in a maze of fine distinctions, hardly warranted and practically of doubtful value. It is difficult to comprehend why the diseases of the pulp should be divided under so many heads, and yet it is easily understood that there are pathological states or periods when the pulp, for instance, presents all the conditions named; but these so imperceptibly glide one into the other in the progress of the disease that the division into distinct and broadly-defined diseases, with a separate nomenclature, must be regarded as straining diagnosis to the extremest limits.

As a result of his ideas he divides the diseases of the pulp, under the general head of *pulpitis acuta*, into the following subdivisions: *pulpitis acuta septica s. superficialis, pulpitis acuta partialis,*

pulpitis acuta totalis, *pulpitis acuta partialis purulenta*, *pulpitis acuta traumatica.* Under chronic inflammation of the pulp (*pulpitis chronica*) he gives *pulpitis chronica parenchymatosa*, *pulpitis chronica totalis purulenta.* Under chronic hypertrophied inflammations of the pulp in general he gives *pulpitis chronica gangrœnosa*, *gangrœna pulpœ totalis*, and *pulpitis chronica idiopathica, seu concrementalis;* and of atrophy of the pulp in general he has *atrophia pulpœ simplex*, *atrophia pulpœ sclerotica*, *atrophia pulpœ reticularis*, *dissolutio pulpœ absoluta.*

In the third division he follows the same line of investigation through diseases of the pericementum, from *periodontitis acuta marginalis*, *periodontitis acuta apicalis*, *etc.*, through twenty-two distinct divisions. Each of these is again subdivided in its treatment under diagnosis,—subjective appearances,—differential diagnosis, and prognosis.

The author certainly deserves great credit for attempting, with a considerable degree of success, to show that these pathological states are capable of distinct definition. While it is possible he has exceeded practical limits, he has performed the very valuable service of classifying these diseases, as far as the writer is aware, in a manner never before attempted. It has been too much the habit to arrange these under two or three general heads, and while this answers the purpose, it is very far from being correct. It is regarded as quite sufficient to apply pulpitis to all grades of inflammation of the pulp. This is certainly inexact, and between this method and Dr. Arkövý's the writer certainly would prefer to accept the divisions of the latter, though it necessitates diagnosing fifteen distinct pathological presentations.

While his work may be regarded as unnecessarily exhaustive, it must be conceded that he presents plausible reasons for his judgment, and this is based, as he says, on "thousands of investigations and observations." Whether his views be accepted or not, the writer must regard the work as the most satisfactory effort in the presentation of these special pathological conditions, from a clinical standpoint, yet attempted. Its value would be greatly enhanced if it were condensed at least one-half, it being unnecessarily prolix.

The author makes no attempt at treatment, nor does he rely to any extent on microscopical investigation, but rests content with detailed and minute descriptions, largely from clinical observations. The divorce of theory from practice greatly decreases the value of the book in a practical sense, and will have a tendency to limit its circulation.

The industry exhibited in searching authorities is not the least remarkable feature of the work. He has apparently left no writing

in German, English, or French unscanned, and the literature of the subjects treated is a curiosity in itself. As a necessary consequence American writers are constantly quoted and given an importance, in some cases, hardly warranted, especially those of a comparatively remote period.

The additions by Drs. Creniceanu and Böke have special interest, particularly that of the former on diseases of the eye in relation to diseases of the teeth. It is carefully prepared in the original work, and the résumé of cases, compiled from various sources, makes it of especial value for reference as well as very instructive in this relation. He devotes forty-seven pages to the subject proper, and two and a half to its literature. That of Prof. Böke covers less ground, being limited to six pages.

The book as a whole must be regarded as a valuable contribution to dental pathology, which is yet comparatively in its infancy.—J. T.

DENTAL MEDICINE: A Manual of Dental Materia Medica and Therapeutics for Practitioners and Students. By FERDINAND J. S. GORGAS, A.M., M.D., D.D.S., professor of dental surgery in the University of Maryland. Second edition, revised and enlarged. Octavo, 370 pp. and index. Philadelphia: P. Blakiston, Son & Co., 1885. Price, cloth, $3.25.

The sale within less than two years of the first edition of this volume is an indication of the need which existed for such a manual. The work has been entirely revised, and many valuable additions made to it, including a chapter on inflammation with special reference to the mucous membrane of the mouth. All the new agents used in dental practice have received notice, and the book gives evidence of conscientious, painstaking labor on the part of the author. An index to diseases and dental formulary has been added, facilitating easy reference to pathological conditions and remedial indications. Additions have also been made to the dental formulæ, with fuller explanations of the methods of prominent practitioners for the special employment of medicinal agents and the results of recent investigations into the properties of anesthetic agents. As this is the only elaborate attempt that has been made to furnish students and practitioners of dentistry with a volume on dental materia medica and therapeutics, it is neither to be compared nor contrasted with any other work. Practically, it stands alone. We could wish that the dental uses of many of the agents described had been more exhaustively presented, as will doubtless be done in future editions; but, notwithstanding this, and some other defects, which might if necessary be cited, the volume as a whole commends itself as an educator and as a work of reference which should be in the hands of every student and every practitioner of dentistry.

A Series of Questions Pertaining to the Curriculum of the Dental Student. By Ferdinand J. S. Gorgas, M.D., D.D.S., of the University of Maryland. Baltimore: Wm. K. Boyle & Son., 1885. Pp. 133. Price, cloth, $1.50.

The object of this work is to facilitate the study of dental science and its collaterals, and comprises leading questions on all the branches belonging to the course of study pursued by the dental student,—embracing dental histology, dental pathology, dental surgery, dental prosthesis, dental materia medica, and therapeutics; general anatomy, physiology, chemistry,—organic and inorganic,—and metallurgy. The questions in these different departments seem to have been in the main well chosen, and correct answers to them would indicate a very respectable familiarity with the several subjects. No student who finds himself able to answer the questions therein contained need doubt his ability to pass a satisfactory examination; and there are not many practitioners who would not be benefited by the mental effort and by the research needed to enable them to give replies satisfactory to themselves to these interrogatories.

A Guide to the Practical Examination of Urine. For the use of Physicians and Students. By James Tyson, M.D., professor of general pathology and morbid anatomy in the University of Pennsylvania, etc. Fifth edition. Revised and corrected. With colored plates and wood engravings. 250 pp. Philadelphia: P. Blakiston, Son & Co., 1886. Price, cloth, $1.50.

This very comprehensive but compact manual has in this fifth edition been thoroughly revised by the author, and includes a plain and practical consideration of the latest and most reliable tests of pathological conditions of the urine, and as well an examination of that class of proteids represented by peptines and musin as constituents of urine. The book admirably meets the wants of both students and practitioners.

The Principles and Practice of Surgery. By John Ashhurst, Jr., M.D., professor of clinical surgery in the University of Pennsylvania, etc. Fourth edition, enlarged and thoroughly revised. With 597 illustrations. Octavo, 1067 pp. and index. Philadelphia: Lea Brothers & Co., 1885. Price, cloth, $6.00; sheep, $7.00; half Russia, $7.50.

In revising this work for a fourth edition the author seems to have spared no pains to furnish in as concise a manner as possible explicit descriptions of the modes of practice now generally employed in the treatment of surgical affections, and to give a lucid exposition of the principles on which such practice is based. The revision ap-

pears to have been very thorough, the present volume containing the latest contributions to surgical science in this and other countries. Material additions have been made to the illustrations from original drawings and photographs. The work, though necessarily compendious, is a very excellent presentation of modern surgery. The illustrations, printing, and binding are specimens of the admirable workmanship which characterizes the productions of the publishing house whose imprint it bears.

Notes on Anæsthetics, with an Appendix containing Illustrative Cases and Engravings of Anæsthetic Apparatus. By Arthur S. Underwood, M. R. C. S., L. D. S. Eng., of the Dental Hospital of London, etc. First edition. 116 pp. and index. London: Claudius Ash & Sons, 1885.

In this little volume the author, after devoting a brief chapter to a history of anesthetics, follows with a general consideration of facts common to all anesthetics; while subsequent chapters are devoted to nitrous-oxide gas, ether, and chloroform, and the concluding chapter to a discussion of the physiology of anesthesia. There follows an appendix of notes, from A to H, treating of duties of the operator, artificial respiration and syncope, etc., with a number of illustrations of apparatus. The author claims that his work carries with it the authority of Mr. Woodhouse Braine; that he has spared no pains to search out interesting matter scattered through the pages of journals and the transactions of learned societies. We do not hesitate to pronounce it a useful compend, which would certainly prove serviceable to those who are in want of guidance in the administration of anesthetics.

A Manual of Operative Surgery. By Lewis A. Stimson, B.A., M.D., surgeon to the Presbyterian and Bellevue Hospitals, etc. Second edition, with 342 illustrations. 498 pp. and index. Philadelphia: Lea Brothers & Co., 1885. Price, cloth, $2.50.

This manual is an attempt to compress into small space the operative methods and procedures in general surgery. In a volume of this size, it is evident that minuteness of detail had to be avoided, and that judicious selection had to be made of the method deemed the best. The author has undoubtedly shown a rare ability in describing the essential features of most of the operations in modern surgery, and yet in many cases with such descriptions of the anatomical relations and of the necessary details as are required to an intelligent appreciation of the operation. So far as it is possible within the limits which the author assigned himself, he has furnished an excellent surgical compend.

Post-Mortem Examinations, with Especial Reference to Medico-Legal Practice. By Prof. Rudolph Virchow, of the Berlin Charité Hospital. Translated by T. D. Smith, M.D., R.C.S. Eng. With additional Notes and new plates. From the fourth German edition. Pp. 138. Philadelphia: P. Blakiston, Son & Co., 1885. Price, cloth, $1.00.

The name of Virchow as the author of this volume is a guarantee of a thoroughly scientific treatment of the subject. A systematic method of conducting post-mortem examinations is presented, indicating how such a plan should be followed in all cases in which medico-legal purposes are to be subserved. The method is given in detail, and familiarity with it could not fail to be instructive to the student, even if never put into actual practice by him.

Transactions of the American Dental Association, at the Twenty-fifth Annual Session, held at Minneapolis, commencing on the 4th of August, 1885. Philadelphia: The S. S. White Dental Manufacturing Co., 1885.

The transactions of the last meeting of this important body appear here in an inviting volume of 178 pages. The reports, papers, and discussions on subjects of vital interest to the profession may justly demand for it a place in the library of the dentist. But it would have been well if the Publication Committee had exercised the editorial function more thoroughly, and consigned to the realms of forgetfulness some of the matter, which does no credit to the speakers nor to the association. If this committee has not sufficient discretionary power at present, more should be given, and then used in the interests of the association and to the advantage of the reputation of the profession. As usual of late years, the printers have executed their part of the work in a way that leaves little to be desired in that respect.

Pamphlets Received.

Diseases of the Period of Dentition. Address delivered before the American Academy of Dental Science, at its eighteenth annual meeting, held in Boston, November 4, 1885. By W. C. Barrett, M.D., D.D.S., of Buffalo, N. Y. Buffalo: "Independent Practioner" Print, 1885.

Iritis: Its Relation to the Rheumatic Diathesis and its Treatment. By Charles J. Lundy, A.M., M.D., professor of diseases of the eye, etc., in the Detroit College of Medicine. Reprinted from "The Physician and Surgeon."

OBITUARY.

DR. W. G. REDMAN.

Died, suddenly, at Louisville, Ky., November 11, 1885, Dr. W. G. Redman, in the sixty-seventh year of his age.

Dr. Redman was born near Eldridge, Onondaga county, N. Y., April 2, 1821. His father was a prominent physician there, and the son studied medicine with him. In 1843 he settled in Shelby county, Ky., teaching school for a time, and subsequently practicing medicine, until 1849, when he removed to Henderson. In 1860 he settled in Louisville, and began the practice of dentistry. He was one of the original members of the Kentucky Dental Association, and for a time its president; was also one of the presidents of the Southern Dental Association.

Dr. Redman's health began to fail about seven months ago, and his sudden death was due to heart disease. He was esteemed an excellent operator, and an affable and agreeable gentleman. He leaves a widow and ten children.

DR. J. H. BEDFORD.

Died, at Louisville, Ky., November 11, 1885, of Bright's disease, Dr. J. H. Bedford, in the forty-eighth year of his age.

Dr. Bedford was born in Bourbon county, Ky., August 16, 1838, where he was raised and educated. He studied dentistry early in life, and began the practice of his profession in Louisville about twenty years ago. He built up a large practice, and was considered an excellent dentist.

At a meeting of the dentists of Louisville, called to take action upon the deaths of Drs. Redman and Bedford, resolutions were passed expressive of the high esteem in which they were held by their professional brethren.

DR. CLARK LOWELL GREGORY.

Died, at Ontario, Cal., October 9, 1885, of consumption, Dr. Clark Lowell Gregory, in the thirty-first year of his age.

Dr. Gregory was born at Aldine, Mich., January 29, 1855; graduated at the University of Michigan in 1879, and was married in the same year, at Coldwater, Mich., to Miss Idrie H. Briggs, M.D. He practiced at Coldwater until the fall of 1880, when he removed to Chicago, remaining there until the spring of 1885, when he removed to Ontario, Cal.

PUBLISHER'S NOTICE.

THE NEW VOLUME.

The present number introduces the Twenty-eighth Volume of the Dental Cosmos. Succeeding numbers will be issued on the first of each month during the year.

We believe that every volume in the past has in some good respect surpassed its predecessors. How to make the current volume still more useful to its readers, and still more worthy of the position universally accorded to the Dental Cosmos as the leading dental journal of the world, is and will be the constant ambition of its managers.

We shall earnestly endeavor to secure the freshest and most instructive matter in each department of theory and practice, and to make every issue a valuable means of development to the student and practitioner; a periodical record of thought and progress invaluable and indispensable.

In generous rivalry with all other reputable journals, we shall labor unceasingly to deserve and to maintain the reputation of leadership in dental journalism.

A subscription blank will be found preceding the advertising pages. Subscriptions are required to commence with the January or July number. Price, $2.50 per annum, including postage to the United States and Canada. Subscribers in all other countries will remit the postage, the rate of which to Universal Postal Union countries is 50 cents; to Australia and New Zealand, 96 cents, per annum.

THE S. S. WHITE DENTAL MFG. CO.

PERISCOPE.

Opposing Baltimore Medical Colleges.—The State law of Pennsylvania demands that all medical students who graduate outside of the State shall have their diplomas indorsed by some recognized school in the State. Heretofore both Jefferson College and the University of Pennsylvania have indorsed such diplomas, Jefferson College only making exception in cases of irregular or bad schools. But in order to more fully comply with the State law the University of Pennsylvania will hereafter demand that all students who want their diplomas indorsed must stand an examination before the faculty, and for such an examination pay $30.

While the University states that this change is made to more fully comply with the State law, it is in reality done to *compel* students to attend the Pennsylvania schools. This will greatly affect the Baltimore schools, as a large number of students from Pennsylvania attend here.—*Cor. in Baltimore Times.*

The Maryland Dental Law.—In your issue of Friday, October 16, under the caption, "Opposing Baltimore Medical Colleges," a correspondent directs your attention to the fact that "the State law of Pennsylvania demands that all medical students who graduate outside of the State shall have diplomas indorsed by some recognized school in the State," and further adds that this "is in reality done to compel students to attend the Pennsylvania schools."

Your correspondent and possibly your readers may not know that the Legislature of 1884 passed a dental law which makes it unlawful for any one to engage in the practice of dentistry in Maryland unless he shall have passed a satisfactory examination before the board of dental examiners, or *shall hold a diploma from a university or college chartered by or under the laws of said State.*

This peculiar and exclusive provision of the Maryland law has been considered most illiberal, and calculated to do great injustice, as by implication it reflects upon the character of all schools located outside of this State by rendering their diplomas valueless.

The Pennsylvania State Dental Examining Board, about a year ago, in a protest which was filed with Attorney General Roberts, and to which the attention of Govenor Lloyd has since been called, said: "Certainly you cannot regard as either generous or just a law that denies recognition to diplomas granted in other States, when those same States recognize and indorse the diplomas granted by the schools of your State. Twenty States in this country have laws regulating the practice of dentistry, and of them all yours is the only one that does not acknowledge the diplomas of any reputable dental school as conferring the right to practice within its borders." The National Association of Dental Examiners also expressed itself in the same direction, as follows:

> *Whereas*, The dental law of the State of Maryland seems to be restrictive in its character, it is the sense of this body that the dental profession of that State should, at the next session of its Legislature, seek to have this dental law so amended as to be in harmony with the dental laws of the other States.

From the above your correspondent may see some excuse for

Pennsylvanians endeavoring to comply with their State law, and demanding that all students who want their diplomas indorsed must stand an examination before the faculty of some recognized school in that State, and "for such examination pay $30."—*Cor. in Baltimore Times.*

HINTS AND QUERIES.

The Cart Before the Horse.—In the September number of the Dental Cosmos may be found the address of Dr. Peirce ("A Factor in Tooth-Preservation") before the New Jersey State Dental Society, and in the October number the discussion of the paper appears in full.

That both are exceedingly full of interest cannot be denied, and, though "one of the least in the kingdom," professionally, yet I respectfully beg to differ with the learned doctors upon one point,—in fact, *the* one point of the discussion,—*i. e.*, that "tooth-formation is the *result* of differentiation in the food-habit." I marvel when the lights in our profession, the bearded veterans in our army of tooth-savers, to whom we who have more recently enlisted in the ranks look for guidance and wise counsel, expend so much powder, so much logic, so much brain-force, trying to make the cart draw the horse.

Tooth-formation the *result* of food-habit? Was the whole animal kingdom endowed in the beginning with precisely the same dental organs, and is the food of each type of animal responsible for the present form of its dentition? Over and again in his address the doctor enunciates my text, "tooth-formation the *result* of food-habit." Is it not possible that, when the All-wise Creator made man and the lower animals, He foresaw their needs, and not only furnished them with food, but also with such dental organs as best suited their needs? Methinks that when God made the cow He intended that she should browse the green herbage, and neither science nor history teaches us that she ever had the superior incisors of the horse, sheep, or goat.

The essayist states that the incisors of the Rodentia are the *result* of the gnawing habit, and cites the case of the beaver as a remarkable illustration of that type. What proof have we of this? May I not as authoritatively state that the incisors of the beaver were designed from the beginning for, and especially adapted to, the uses and instincts of that animal? If that be not so, and the beaver was endowed with a propensity to gnaw, and had nothing with which to perform that operation, then will the doctor kindly inform us how many centuries it took to develop the necessary organs, and how the poor rodent employed his time during the period of their developement? Food-habits and life-habits may, and doubtless do, *modify* the teeth to some extent, but that they *make* teeth I most emphatically deny.

In the discussion of the paper, and in fact in the paper itself, the subject of tooth-preservation seems to have been lost sight of, and, reasoning from Dr. Peirce's stand-point, the logical deduction was that man in a few centuries would have but twenty-eight teeth. I cannot reason this out satisfactorily to my own mind either from science or history. For history, we cannot do better than to inquire of the Egyptian mummy, and if over four thousand years have done practically nothing toward the elimination of the wisdom-tooth or the sixth-year molar, when, in heaven's name, may we look for the "change in type." Quite a number of my adult patients still retain a few of the milk teeth. Why not reason from this

that the time will come when there will be no use for the permanent incisors, cuspids, and bicuspids?

In further proof of his argument, the essayist refers us to Prof. Marsh for information concerning the ancestry of the horse, and Dr. Abbott recites the mythical story of the evolution of that noble animal from a sort of herbivorous dog a foot or so in length to an animal of his present capacities and capabilities. It is very singular that this remarkable quadruped does not go on in his propensity to enlarge until he becomes a mastodon, or drops off his remaining toes, and evolves a pair of wings and flies. We are told that this embryo lilliputian horse, being subject to the ravages of carnivorous animals, had to flee for its life, and that this enforced physical exercise developed the present type of the horse. There is a screw loose in this line of reasoning somewhere; for, if the horse, in order to attain greater speed, found it necessary to leave some of his toes behind, how is it that the wolves still retain all their toes and are able to run down the fleetest equine that ever crossed their path? And why has not the wolf attained the size of the elephant, since he was larger than the horse at the start, and must have indulged in as much, or possibly more, physical exercise? Dr. Abbott concludes this remarkable bit of equine history by saying, "The necessities of the animal have forced it into these changes; * * * and so it is with the human race."

The climax is reached here, and the case proven beyond a doubt. As it was with the horse, so shall it be with man. I pause, almost overwhelmed by conflicting thoughts and emotions. O man! where would you have been to-day had the carnivorous animals chased you instead of the horse? A Centaur, verily! O mares of the Magnesian Plains, and he whom ages have proclaimed to be your consort, you are at last rescued from ignominy and shame by the ingenuity and science of the nineteenth century! You are no longer the progenitors of that fabulous race of monsters; they were a race of poor unfortunate men, who were chased by carnivorous animals! I see it all now. They must flee for their lives; they could not do this fast enough on two legs, therefore they evolved two more, dropped a few toes, and finally became Centaurs! How glad I am to have this matter explained. I always blushed for the part man was supposed to have played in this affair. Now I know it was not a sin, but simply the result of circumstances. In other words, "the necessities of the case forced them into this change." And now, O man! the genius that discovered and promulgated this great truth says that you do not need but twenty-eight teeth, and as it was in the days of the Centaurs, so shall the coming man be,—"the necessities of the case shall bring about the result,"—and twenty-eight teeth shalt thou have and no more!

I am a constant reader of the Dental Cosmos, and revere much what the learned professional brethren have taught us through its pages; but, in the language of the psalmist, "such knowledge is too wonderful for me." Somehow I fail to take it in; yet I need not fear, for, if "the necessities of the case demand it," shall I not be able to *evolve an understanding* that shall grasp the idea?

I find it about as difficult to stick to my text as the essayist did to "a factor in tooth-preservation." Looking at the question in any light but that of the Darwinian theory, I am constrained to believe that *tooth-formation is not the result* of food-habit, but that it is *wonderfully adapted to* the food-habit. And this not by circumstance, but by Infinite Wisdom, just as everything else in nature is accurately and harmoniously adjusted.—W. H. Pomeroy.

Disinfection and Antiseption by Heat.—The writer having been very much interested in the details of the treatment of devitalized teeth as described

by Dr. G. O. Rogers, has asked and obtained permission to lay it before the profession. Premising that the roots of a tooth are in normal condition, externally, Dr. Rogers claims that they can be treated and filled at one sitting with absolute certainty of freedom from subsequent trouble. The theory on which he predicates uniform success is that by his method complete disinfection and antiseption are secured. It seems reasonable that if perfect dryness of the root can be effected, the destruction of all microscopic germs accomplished, together with a perfect sealing of the canaliculi, such result would naturally follow. These desiderata are obtained by Dr. Rogers's method through the single and simple application of heat. A fine wire heated to redness and inserted into the canal to the apical foramen,—the application repeated according to circumstances,—is all that is necessary. The common spirit-lamp may be used for heating the wire, but it loses its glow so quickly, in passing from the flame to the tooth, that, considering the difficulty in many cases attending the insertion of the wire into the canal, more than ordinary dexterity is required for the successful accomplishment of the operation. Dr. Rogers therefore resorted to the electric cautery, which can be deliberately placed at the orifice of the canal, then heated to incandescence, and quickly thrust into the entire depth of the root.—W. H.

Rubber, Crown, and Bridge-Work.—A patient of mine, Mr. A. S., had been wearing a partial plate carrying four superior incisors, but had never been satisfied with it. His superior cuspids were badly decayed, and I decided to try a new method. I cut off the crowns of the cuspids, and enlarged the nerve canals so that they would easily admit four steel screws five-eighths of an inch in length. The screws were plated with pure tin. The roots were ground down just under the gum on the labial surface. A piece of bibulous paper was wrapped around each screw so as to hold it in position, and they were inserted in the roots, the heads projecting. A plaster impression was now taken,—the screws coming away with the impression, which was coated with silicate of soda (liquid silex) and filled with plaster. After separating the cast, plain teeth were selected and ground to fit the same as for a plate. The heads of the screws were waxed over, proper occlusion was obtained, and a narrow bridge of wax formed from one cuspid root to the other. The case was invested, vulcanized, and finished as usual. It fitted perfectly, but loosely. The roots were thoroughly dried with bibulous paper and hot air. They were then filled with a cement of oxyphosphate, and the screws forced into it until the plate was in proper position,—the bridge not quite touching the gum, so as to insure cleanliness. The result is a firm, comfortable, beautiful denture.—L. B. Wilson, *Cumberland, Md.*

To the Editor of the Dental Cosmos:

I have in several cases used the new countersunk teeth as crowns to be set upon old roots, in the same manner nearly as the How crown is inserted, first shaping the opening in the root like a funnel, providing it with retaining grooves, and then filling the space in root and crown with amalgam; having previously ground the thin edges of the crown to a perfect fit. The work is very strong, and looks natural from both aspects of the tooth.—W. E. Hyde, *Danielsonville, Conn.*

Dental Anomalies.—In August, 1884, I extracted an inferior right cuspid for a washwoman, of about 45 years of age, which had two distinct roots. The tooth is now deposited in the museum of the Dental Department of the State University of Iowa. Is not this a rare case?

A child was born in this city in July of this year with a fully-developed right inferior central incisor.—G. A. Vawter, *Cambridge, Ill.*

THE

DENTAL COSMOS.

VOL. XXVIII. PHILADELPHIA, FEBRUARY, 1886. No. 2.

ORIGINAL COMMUNICATIONS.

A CRITICAL ESSAY ON THE DEVELOPMENT AND MINUTE ANATOMY OF THE TEETH IN HEALTH AND DISEASE.

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Mr. President and Gentlemen: If I acknowledge the feeling of weakness which often prompts men to shrink from the consequences of placing themselves in a position where they are likely to be misunderstood or misinterpreted, I must also plead the extenuating circumstance that such feeling of weakness is born of past experiences, which have taught me that there are but few men who are sincerely grateful to those who point out their errors of opinion or belief. This is especially true of those who enjoy something of an intellectual reputation which may be founded, to a greater or less extent, upon such errors. Therefore, to criticise with perfect frankness opinions which have become a matter of fixed intellectual pride is often regarded as an injudicious proceeding.

There is too frequently evident in all critical efforts a quality which has regard chiefly for that artificial adaptation to environment known as expediency,—an attempt to conceal more than is revealed, but often to those who read between the lines revealing more than is concealed.

It is the rare exception that discussions of questions of truth or error before scientific or professional associations are free from that exhibition of intellectual gymnastics which seeks by some trick of voice, or emphasis, or rhetoric, or what passes for logic, to win the applause of the moment. At the last, however, only the simple truth remains, and we shall all probably come to see that this exists quite independently of our intentional or unintentional efforts to elucidate or obscure it. But if I correctly apprehend the purposes

of those who are to take part in this discussion, the meeting is destined to be a memorable one; and I trust that it may also prove a dignified exception to many former experiences in being animated by and conducted in that spirit of kind earnestness which should actuate all fellow students and lovers of the truth.

The principal object of this essay, as announced, is the consideration of certain features in the minute anatomy or microscopic morphology of the dental tissues in health and disease.

The reason why I shall preface this consideration with some remarks on the development of the teeth, is that I have grown more and more to see the futility of any attempt to arrive at unanimity of opinion concerning either morphology or function, except through a careful study of the history of the development of the organism; and not only of the individual organism, which is the immediate object of our studies, but of the lower forms of life which lead up to it.

While I cannot believe that these higher and more complex organisms have evolved themselves by a process of slow but continuous development from a more lowly condition, but rather that the creation of each succeeding higher form of life has been effected by the superposition, or rather the infusion, of a higher quality of life-energy from the source of all life, yet I cannot but recognize that there is an intimate bond of relationship between all forms of life, and that, as I have before said, the complex and oftentimes obscure conditions which prevail in higher forms of life are expressed in simpler and therefore more easily comprehended terms in lower forms. Therefore, I repeat a statement that every biologist of note of the present day will confirm,—a comprehensive knowledge of the structural relationships and functions of an organism is only to be gained by a careful study of the history of its development, both from the stand-point of ontogeny and philogeny. This statement is quite as applicable to the teeth as to the organism as a whole or to any of its parts; and upon it is based the views presented in this paper.

There is one other principle to which I wish to call your attention, and the importance of which I wish to emphasize. It is that, while the organism is developed and exists as a unity, while it is inter-dependent in all its parts to the extent that every molecular change which occurs in the finger tips modifies, in its degree, other changes which are occurring in remote parts of the body, yet the development and maintenance of every part is under the special domain of its own inherent typal energy and environment. There are individuality and structural peculiarities as well as unity in development, and this in accordance with the function or use to be performed. This principle has not been observed by those who have

carried similarity of development, structure, and function so far that it has become identity. The importance of this point will be seen as we proceed.

If I were asked to express in a single sentence all that is meant by the term development as applied to animal organisms, I should say it is the focalizing of life-energies in certain territories in accordance with typal ancestral endowments and limitations. In elaboration of this, I would say that, in the development of complexity from simplicity of structure, the first observable departure from uniformity is an increased activity in the formation of the elements or corpuscles at the point where the new departure is to take place, or the point from which the development of the new organ begins. And I would characterize the initiative impulse which leads to this more rapid cell-proliferation, as it is usually called, as the focalizing of life-energies at this point. It is the formation of a new center from which the circumference of the new organ will be unfolded, and this in accordance with that great universal law, applicable alike to corpuscle, organism, or world,—"creation proceeds from center to circumference."

As the germ of every human tooth springs from two distinct sources, it may be said to have two centers of origin,—the first arising in the epithelial layers, from which the enamel-organ is developed; the second from the underlying dermal tissue, from which the dentinal germ is developed. It may be well, at this point, to call attention to one of those errors of comparison to which I have referred. In a recent work on histology by a high authority the statement is made that teeth are developed in the same manner that hairs are. Other writers have asserted that the process of develop ment in nails, claws, hair, and teeth is the same. Such statements show both a lack of close and careful observation and an absence of fine perception of what development means. They have simply glanced at the surface and seen certain similarities, and they go away and say the processes are the same. They seem not to know that if the processes by which a tooth is developed were the same as those that result in the formation of a hair, there would be in the end not a tooth, but a hair. There are important differences in the methods of development, and those differences are determined by the function or use which each organ or appendage is destined to perform. While from observation we can predicate nothing from the appearances of these centers of development at the commencement of the process, yet we may see, if our observation be carefully continued, that differences become more and more apparent at each succeeding stage, and we know that this is determined at the beginning.

It is not necessary for the purpose of this paper to go over all the ground of the evolution of the dental tissues. Permit me, then, to call your attention at once to this illustration of a developing tooth at the commencement of the process of calcification of the dentine and enamel. You see here the dentine and enamel pulps inclosed in a sac, in which these processes are taking place. This sac was for a time connected with the epithelial layers of the mucous membrane by means of a tubular cord of epithelium. This cord was simply an elongation of the primitive bud from which the enamel-organ is finally formed. After the developing tooth is completely inclosed in its sac this epithelial cord is broken up, and there is seen to result from its breaking up little whorls or globular masses of these epithelial corpuscles.

As there is a deeply interesting subject which may have some connection with this disappearance of the enamel-cord, you will permit a little digression here. You know we not infrequently find departures from the normal number of teeth in the mouth; we find extra or supernumerary teeth, as they are called. We also sometimes find teeth developing in other parts of the body. I have here for your examination some specimens of quite perfectly formed teeth, which were taken from an ovarian cyst. The question at once arises in our minds, What antecedent conditions have led to the formation of these supernumerary teeth, whether in the mouth or in locations remote from their usual position? In the development of the second and third molars we observe that the germs from which they grow arise as buddings from the cord of the first molar germ; the cord of the second molar arising from that of the first, and the third from the second. This has led to the conclusion that under certain conditions any portion of the epithelial cords of the tooth-germs may develop into an enamel-organ or pulp. We have also observed that a dentinal germ is always formed directly beneath the enamel-pulp wherever it drops down into the dermal tissue. It thus seems that the presence of the enamel-pulp is the immediate antecedent of the dentinal germ. This view is confirmed by the fact that in the formation of the teeth of some of the lower forms of life, in which the fully-developed tooth has no enamel, there is, at the commencement of the process of development, the correlative of what becomes the enamel-pulp of the teeth of higher organisms. This is very strong evidence that the presence and position of an enamel-pulp determines the formation of a tooth at that point. This is a beautiful illustration of the statement before made, that in the endeavor to unravel the complex relations existing in the higher organisms we are often greatly assisted by a study of the lower forms. Now, if any portion of the enamel-cord may develop into

an enamel-pulp, and if the enamel-pulp determines the formation of a tooth, then there is a reasonable probability that those little whorls or globular masses of epithelium which result from the breaking up of the enamel-cord may, under unusual conditions, result in the development of a tooth, and that these globular epithelial masses may be carried to remote parts of the body and there result in the formation of teeth. You may object that there are too many "ifs" and probabilities surrounding this question; but I have only to reply that, in the absence of all positive knowledge, the highest probability stands as the next best thing, and the whole theory of evolution and many other modern scientific doctrines rest on a less secure foundation.

It is but proper to mention, however, that there is another theory for the formation of teeth in ovarian cysts, which is that in the formation of the embryo some portion of the epiblast in the region of the mouth becomes caught and infolded within the body cavity as the body walls close together. If we turn now to our illustration of a developing tooth, we observe that it is completely surrounded by a sac composed largely of spindle-shaped connective-tissue elements. We see that its vascular supply is concentrated at two points,—in the dentinal pulp and around the enamel organ; and this is precisely what we should expect, for the one is the formative organ of the dentine, and the other of the enamel. It is seen that the formation of dentine begins at the line of its junction with the enamel, and proceeds inward and downward, and that the formation of enamel begins at the line of its union with the dentine and proceeds outward. I believe there are those who do not regard this as the manner in which these tissues are formed. But there is such unanimity of opinion among those who have done any considerable practical microscopical work in this direction, that it is hardly worth while to discuss the point with those who would not care to be known as holding critical views on the development and histology of the teeth.

What is the process by which dentine and enamel are formed? We now approach the consideration of an important question, and the one upon which my criticism of well-known and popular writers upon the histology and pathology of the dental tissues is largely based. The formation of dentine begins shortly before that of enamel, and its first appearance is that of a cloudy, cartilaginous-looking line, which is seen just outside of the odontoblasts, occupying the most prominent point or points in the developing tooth. At the same time delicate fibrillæ are seen sprouting from the outer ends of the odontoblasts. As this line of forming dentine increases in thickness the odontoblasts are observed to always remain just

beneath it. It is probable that the increase in thickness of the dentine is effected by the continued secretion of the cartilaginous matrix, which has been called calco-globin, and the almost simultaneous deposit of the mineral constituents in this matrix. The forming line of dentine is probably pushed upward and outward by the continued deposit from the odontoblasts. As the process approaches completion, the dentine is also increased in thickness from within, thus reducing in size somewhat the pulp,—at least that portion which remains in the roots. The growth of the fibrillæ corresponds with the increase in the thickness of the dentine, although they sometimes seem not to be governed by this condition, but grow on and penetrate between the ameloblasts, which lie just outside of and in contact with the dentine. This penetration of the ameloblastic layer by the dentinal fibrillæ is probably always effected before the deposit of enamel begins. These dentinal fibrillæ sometimes continue to grow, their terminal points keeping just in advance of the outer line of forming enamel, so that when the enamel is completely formed its entire thickness is traversed by these fibers. This is not of common occurrence, but I think it can hardly be regarded as a departure from normality, for I have many times observed the dentinal fibrillæ penetrating the entire thickness of the enamel in the teeth of animals.

Every appearance of the formed dentine in health and disease, and every phase of its development, contra-indicates the view that it is built up by the calcification of layers of odontoblasts or dentine corpuscles. If this view were correct, we should everywhere see partially calcified corpuscles, which we never do. The line between the forming dentine and the outermost layer of the odontoblasts is always strongly and sharply marked. There is no other possible way of explaining the continuity of the dentinal fibrillæ, now that it is demonstrated beyond all possibility of doubt that they are offshoots or prolongations of the odontoblasts. The building up of the dentine by calcification of the successive layers of corpuscles was necessarily accompanied by the theory that the dentinal fibrillæ were offshoots of the reticulum of the pulp, which offshoots passed between the odontoblasts into the dentine. The demonstration of this error removed the only foundation upon which that whole theory rested. The most logically constructed theory becomes valueless when the premises upon which its first postulates rest are disproved. I know that many regard all scientific theories as matters of minor importance. But when we realize that the entire practice of medicine, involving as it does the great practical questions of human life and happiness, rests almost entirely upon theory, we see the importance of applying the most rigid tests to all assumed

basal principles. Our practice must depend upon our perception of pathological conditions; and the clearness of our perception of these conditions grows out of our knowledge of structure and function, and this knowledge, we are growing more and more to see, rests largely upon the history of the unfolding or development of the organism. I do not wish to be understood as passing any criticism upon the teachings of the honorable gentlemen whose theories I am considering, except so far as they have relation to the development and histology of the teeth. I must regard these teachings as in many respects erroneous, and in other features as giving undue importance to and emphasizing certain points in the histology of the teeth which have long been familiar to practical microscopists in this field. It is a tendency not infrequently manifested by scientific workers in special directions to so magnify the importance of some particular aspect of the truth that it is distorted out of all relation to the many qualifying truths to which it is related. It has been assumed that because bone and cementum are formed by the calcification of globular territories, and because dentine bears some slight resemblance to bone and cementum, therefore it is built up in a similar manner. This is but another evidence of that hasty deduction from inadequate study of which I have already spoken. Many writers have labored to draw the most absurd comparisons between bone and dentine. But dentine remains dentine just the same, and the difference in the completely developed tissues is the correlative of the difference in the methods of their development. In the development of bone, and to a considerable extent in cementum, the original osteoblast or cementoblast remains as the persistent center of the calcified territory, and the source from whence its continued integrity is maintained. Now, in dentine the only thing corresponding to this persistent center is the dentinal fibrillæ. But the dentinal fibrillæ are continuous processes running from the odontoblasts on the surface of the pulp through the entire thickness of the dentine to the enamel. Neither are they the center of what was once a larger territory occupied by the odontoblast, as I have shown when speaking of the growth of the fibrillæ. By a process of reasoning by exclusion, and by the evidences shown by the microscope, we reach the conclusion that the formation of dentine is effected by a process of continual deposit from the enamel inward, until the typal demands of each tooth are satisfied. One other fact, which in itself is sufficient to demonstrate the impregnability of this position, is the free branching of the fibrillæ at their terminal points, while in the deeper layers of the dentine and in the region of the pulp-canal it is far less marked, and in many cases there is almost an entire absence of this branching. There is one other feature of the his-

tology of a developing tooth which, if carefully studied, will also demonstrate the impossibility of the theory under criticism. The odontoblasts, as before mentioned, are observed to send a varying number of fibers into the dentine, five or six of these fibers sometimes arising from a single corpuscle. These corpuscles or odontoblasts are also observed to be connected with the pulp reticulum by root processes arising from their inner ends, and these latter processes do not correspond in number with the dentinal processes arising from the same corpuscle. If the dentine were formed in the manner described by Dr. Heitzmann, there would be great irregularity in the direction and arrangement of the dentinal fibers; which is not true, the arrangement and continuity being, in normally developed teeth, uniform throughout the entire thickness of the dentine.

The enamel is formed from the ameloblasts. These bodies are derived from the Malpighian layer of the epithelium of the mucous membrane. They are the active secretory elements in the formation of enamel. I have in former papers pointed out the relationship existing between the enamel-organ and other glandular bodies derived from the epithelium. As before mentioned, and as beautifully shown in the drawing, there is a free supply of blood through an intricate capillary plexus surrounding the enamel-organ.

The precise part played by the reticulum or interior portion of the enamel-organ in the development of enamel has not yet been fully determined, but it is quite probable, as pointed out by Dr. Sudduth, that the presence of the reticulum of the enamel-organ is not necessary throughout the entire process of enamel formation, but rather that it is a matrix or receptacle in which is stored and partly elaborated the material for the commencement of this process. But the fact that we find, in sections of the persistent growing teeth of the Rodents, this same reticulum of the enamel-organ is a demonstration of its importance. In the formation of enamel the error of the teachings of Dr. Heitzmann is even more evident than it is in dentine. There is never to be seen but a single layer of the prismatic enamel-cells which surmount and surround the forming enamel. The line which separates the ameloblasts from the forming enamel is even more strongly marked than in dentine. There are, however, important differences between the formation of enamel and dentine. Transverse and longitudinal sections of enamel show that it is built up in the form of prismatic elements, which have a wavy and also in some locations—notably on the points of the cusps—a spiral arrangement. Now, we know that the functional activity of every corpuscle proceeds from its center outwards, the circumference being less highly endowed than the center. We have seen

that the ameloblasts constantly recede outward before the line of advancing enamel-formation. We know that the enamel-rods, as a rule, are continuous throughout the entire thickness of the enamel, and that each enamel-rod is ensheathed in a substance differing in appearance from the rod itself. This covering of the enamel-rods is also the cement-substance which unites them.

It seems that as the ameloblasts recede or grow outward they leave behind, in the forming enamel, the intra-cellular cement-substance which forms the low-grade fixed material of which the external of every enamel-rod is formed, and this constitutes the matrix of the enamel into which the active functioning portion of the ameloblasts deposits the phosphate of lime and other mineral elements.

If the cell of the honey-bee were continuous throughout the entire thickness of the comb, and had that same wavy and twisted arrangement which the enamel prisms have, it would form a beautiful illustration of the structure of enamel; the waxy substance of which the walls of these cells are composed corresponding with the organic matrix or inter-prismatic cement-substance of the enamel, and into this organic matrix the ameloblasts deposit the mineral constituents, as bees deposit honey in the wax-cells of the comb. This view is confirmed by all the appearances of developing enamel, and necessitates no departure from the functional order of every morphological unit of which the body is composed. As the formation of the enamel-prisms proceeds outwards, and as these prisms are not perceptibly larger at the circumference than at the line of union with the dentine, we may see that, if there were only a limited and definite number of enamel-formers or corpuscles at the commencement of the process, as the enamel-cap is a modified sphere, there would be everywhere throughout its substance cone-shaped cavities. Extra or supplementary cells are therefore provided for the filling in of these widening spaces, and in longitudinal sections of enamel we may see where this process begins. These extra cells probably arise by division of the ameloblasts. But it should be remarked that this same appearance may be caused by the twisted enamel-rods coming into view just at the point where the section was cut. Many absurd blunders of interpretation arise from regarding the plane of the section as a complete picture of the entire structural arrangement. The enamel-organ is sometimes spoken of as having a stirrup-shape, from the appearance of a section, when it is, as a whole, an invaginated, modified cone or sphere. What Dr. Abbott has illustrated in Fig. 4 of his recent paper on the pathology of enamel as an abnormal, irregular arrangement of the enamel-prisms is due simply to the specimen having been cut through a territory

where the forward direction of the enamel-rods or prisms was diverted by the spiral arrangement of which I have spoken. I have many times seen the same appearance in normally-developed teeth. In truth, this arrangement of the enamel-prisms is one calculated to give the greatest possible amount of strength, and is, as I have remarked, found at those points which must maintain the greatest resistance in mastication. We should therefore always expect to find such an arrangement in teeth of the highest organization,—an anticipation which, I believe, careful observation will confirm. Neither can I regard the stratification or pigmentation of enamel, as elaborated in Dr. Abbott's recent paper, as a matter of much importance from a pathological stand-point, for these appearances are common in the teeth of animals in which caries is never found, so far as I am aware. As the formation of enamel approaches completion we find that the ameloblasts gradually disappear. We have observed, during the formation of enamel, a layer of flat cells lying just outside the ameloblasts. This layer of cells I believe to be hardened by direct calcification as Nasmyth's membrane. It is this layer of flat, calcified epithelial elements which gives the glossy, polished surface of perfectly-formed enamel. This layer has been supposed by some to be a continuation of the cement-forming organ. But this is a mistake. The cement-forming organ is a modification of the original tooth-sac, and, as this sac extends completely over the enamel, some portion of it may become infolded in the formation of the sulci of the teeth, and then be stimulated, perhaps by the supply of lime-salts, to the formation of cement territories in the depressions of the molars and bicuspids. But the calcified layer of cells forming Nasmyth's membrane will never, I think, be found outside of these cement territories. All of that portion of the tooth-sac which covers the crown usually disappears, or is modified, as I think, into the so-called *ligamentum dentium*, without assuming that function which is the special work of the lower part from which the cementum is formed, and which remains as the peridental membrane or pericementum surrounding the completely-formed root. No one who has studied the development of this last-mentioned tissue could be led into the error of speaking of it as a double membrane. It has, as I pointed out in my earlier papers, a double osteogenetic function—that is, the inner portion lying next the cementum contains the cementoblasts, while the outer portion lying next the alveolar walls contains or consists of the osteoblasts or bone-forming cells. But no misuse of terms and comparisons can construe its significance into that of a double membrane.

From this slight digression we again turn to a further consideration of the structure of enamel and dentine in health and disease.

I must deny *in toto* the theory that there are special enamel-fibers in the sense that the prolongation of the odontoblasts are fibers.

Enamel is, as we have already seen, formed in an entirely different manner from dentine. Dentine is formed in territories of which the odontoblast fibers are the centers. The method of the formation of enamel is quite the reverse of this, for the only portion of enamel which can be spoken of as organic *surrounds* the enamel-prisms. When enamel is cut longitudinally there *is* an *appearance* of fibers, but it seems very strange that those who have written so much about enamel-fibers have not seen that this appearance results from the division of this organic matrix which surrounds each prism. A transverse section demonstrates this, and it is a notable fact that the only transverse section of enamel shown in Dr. Heitzmann's book presents no appearance of these hypothetical enamel-fibers. Such an appearance would be utterly inconsistent with the method of development and arrangement of the enamel-prisms, and yet these fibers are shown in all of the longitudinal illustrations.

There is sometimes, though not frequently, observed in developing teeth, where the enamel-forming cells are pulled away from the partially calcified enamel, an appearance of fibers. I have also occasionally seen in developing teeth an appearance, in cross or transverse sections, like a nucleus in the center of the enamel-rod.

Dr. Sudduth's explanation of this appearance is so concise and clear, and so in harmony with my own observations, that I quote from him. He says, when speaking of the ameloblasts being torn from the semi-calcified mass of forming enamel, "This semi-calcified material, which adheres to the ameloblasts" as they are drawn out, "gives the appearance of a fibril or prolongation of the cells themselves. These fibrils, which have been called Tomes's processes, I consider as thus being mechanically made, for they do not always appear, but depend upon a certain condition of the calcific material. They do not occur persistently, as do the fibrillæ of the odontoblasts. I have succeeded in demonstrating them in sections of pig's teeth, under favorable circumstances, where they showed very plainly indeed, being nearly or quite as long as the ameloblasts themselves, *and several times longer than the enamel was thick.*" It is as though one were to dip the ends of one's fingers in a thick syrup, and on withdrawing them the syrup would be drawn out in strings as the ameloblasts draw out the gelatinous matter on the surface of forming enamel. This is the only appearance of fibers to be seen, and this only in forming enamel. It is therefore seen that this appearance has nothing in common with the so-called enamel fibers described in Dr. Heitzmann's work. To what conclusions are we forced by the evidence? That enamel, once completely developed, under-

goes no structural change during life, and probably no molecular change,—at least, not in that portion which constitutes ninety-seven per cent. of its composition. There is the highest probability that all changes which occur in enamel are the result of the slightly increased or diminished amount of fluid which may penetrate from the dentine or the surface. The human body is not the scene of a hodge-podge of physiological activities. There is order and exactness everywhere. Bile is not secreted in the kidneys if the liver happens to be out of order; neither will the lungs elaborate chyle out of food-material when the digestive tract refuses to perform its functions. There is intimate relationship and mutual helpfulness everywhere, but if evolution and development mean anything they mean division of labor and specialization of function. Dentine is not formed from osteoblasts or cementoblasts, nor is cementum formed from the odontoblasts. Neither can the material from which enamel is built up be elaborated in any other way than through the ameloblasts. How careful the surgeon is to preserve the periosteum if he desires a reproduction of bone! He knows, if its formative organ is destroyed beyond recovery, that there will be no further reproduction of bone at that point. Now, it must be remembered that enamel is the only tissue of the body the formative organ of which not only disappears, but the enamel itself is removed from the position of its development and completely isolated from all tissue concerned in its formation. This is a fact of great significance, and places enamel in a unique position, physiologically speaking, in which it cannot be compared to any other tissue in the body. The odontoblasts and their processes, the fibrillæ, are the elements by means of which the dentine is formed, and they remain after development is completed to maintain the continued integrity of the dentine. And thus it is also with bone and cementum, the formative organs of which remain as the source from whence these tissues receive their nutritive supply. Not so with enamel, however. The ameloblasts are the enamel-formers. Its peculiar morphology and its molecular structure are impressed upon it by these histologic elements. They completely disappear, after which there can be no further formation of enamel. We have no evidence of structural change in enamel after the eruption of the teeth, and structural change, by which I mean change in molecular relationship, is the only change which could improve defective enamel. The apparent increased or diminished liability of the teeth to decay during life must be very largely attributed to changes in environment, changes in the character of the secretions and fluids of the mouth, rather than to any inherent change in the enamel itself. An increased proportion of organic matter in enamel, within certain limits, by no

means necessarily implies increased liability to caries. Every closely-observant dentist knows that a departure from the proper proportion of organic and mineral matter in either direction may result in increased liability to decay. But every dentist of thoughtful experience also knows that more depends upon that initiative organizing force which governs the formation of enamel than upon any changes which ever occur during life. The fact that teeth which are *well* developed will endure the adverse conditions of a lifetime without serious damage, and on the other hand the fact that teeth poorly developed cannot be changed into teeth of excellent structure, at least so far as the enamel is concerned, by the continued good health of a lifetime, is very strong evidence of the truth of my propositions. Understand me. I say that those improved conditions which we all observe and which decrease the liability of the enamel to caries, are largely, probably entirely, due to changes in the environment of the teeth rather than to any change in the structure of the enamel. In truth, change in environment is alone quite sufficient to explain the decreased liability of the teeth to decay. There is no one in our profession to-day who has done more thoroughly scientific work in the investigation of caries than Dr. Miller, of Berlin. I can hardly speak too emphatically of my appreciation of his labors. Dr. Miller's investigations have demonstrated, to the complete satisfaction of any mind which can appreciate the significance of genuine scientific work, that the active immediate causes of caries are acids,—largely those generated in the mouth by fermentation,—which cause decalcification of the mineral constituents, and certain micro-organisms, which destroy the organic matter. Any change, therefore, whether in the nature of local prophylactic or antiseptic treatment, or general systemic treatment, which removes or improves those conditions which are favorable to the formation of micro-organisms, is quite sufficient to explain all decreased liability of the teeth to decay. The statement made by Dr. Abbott in his recent paper, that the increased liability of the enamel to pathological changes which is observed as accompanying change of climate and food-habits is due to changes in the living matter of the enamel, will not for a moment bear the light of real scientific investigation. In former papers, and in his chart representing section of an incisor tooth *in situ*, Dr. Abbott claims that embryonal or medullary corpuscles are formed in the retrograde metamorphosis of enamel. Dr. Heitzmann also teaches the same doctrine in his book. It might be regarded as needless effort to do more than demonstrate that such a retrograde process is impossible from the stand-point of the method of development of the teeth, as I have already shown. But the so-called inflammatory theory has taken such a strong hold upon many in the profession

that it can only be uprooted by placing the absurdity of its claims in the strongest possible light. It may be that in the decay of living teeth in the mouth there is a condition which is the correlative of inflammation in the soft tissues, although the relation is probably very distant and obscure; but this point, if admitted, has no bearing upon the appearance of medullary bodies in caries of enamel and dentine.

In the sixth statement of his summing up of his series of papers on the relation of fermentation in the human mouth to caries of the teeth Dr. Miller says: "I produced caries artificially, which, under the microscope, cannot be distinguished from natural caries, by subjecting sound dentine to the action of these fungi in fermentable solutions." Dr. Sudduth will place under the microscopes for your inspection some of these slides kindly sent me by Dr. Miller, and also some of his own preparation, showing natural and artificial decay of dentine. You will see that it is, as Dr. Miller says, impossible to tell from the microscopic appearances which was naturally and which artificially produced decay. It can hardly be necessary for me to say that no intelligent person would think of making the statement that a dead tooth out of the mouth could return to an embryonal condition. If, then, it is not possible to tell by microscopic examination natural decay from that artificially produced, what becomes of the inflammatory theory of decay? If Dr. Miller's work has *any* value, if *any* conclusions may be drawn from it, then he has certainly demonstrated that the return of dentine and enamel to an embryonal condition, even if these tissues were so built up, is an impossibility; but, as we have already seen, the tissues are not so formed in the beginning.

Let us consider the question from still another stand-point. The dentine of adult teeth may be said to contain from seventy to seventy-two per cent. and the enamel from ninety-six to ninety-eight per cent. of mineral matter, principally phosphate of lime. The appearance of embryonal elements in enamel or dentine means not only the liquefaction, but, to a great extent at least, the decalcification of these tissues. We might very pertinently inquire how this delicate matrix of living matter, constituting in enamel but three per cent. of the tissue, can be made to fill these decalcified tracts. It is asking quite too much of a tissue which it is doubtful if the most delicate methods of decalcification can discover. In an illustration accompanying one of Dr. Abbott's papers the region of enlarged canaliculi, which enlarged canaliculi are represented as filled with nucleated bioplasson bodies, and the statement that they are nucleated means that the living matter has undergone a complete re-organization), corresponds exactly with the infected region of

Dr. Miller. The enlarged canaliculi are everywhere filled with micro-organisms, which destroy the living matter as fast as the acids effect the removal of the lime-salts, thus giving it no opportunity to be re-organized into medullary corpuscles. In fact, these micro-organisms, in destroying or digesting the living matter, effect this enlargement of the canaliculi, and it is these enlarged canaliculi, filled with micro-organisms and débris, that Dr. Abbott has mistaken for fields of nucleated bioplasson and medullary corpuscles.

Gentlemen, the demonstration is under the microscopes; examine the specimens for yourselves. But keep in mind the fact that I rest my case upon the evidence shown in the development of the teeth. This evidence I regard as conclusive and impregnable. To recapitulate, then, the points against Drs. Heitzmann and Abbott:

1st. In the formation of dentine there is never to be seen any evidence of the coalescing of odontoblasts or dentine corpuscles.

2d. There is never to be seen any indication of partially calcified corpuscles; on the contrary, the line which separates the forming dentine from the odontoblasts is always strongly marked, and these tissues are affected by staining agents in an entirely different manner.

3d. There is not uniformity in the branching of the fibrillæ, this peculiarity being much more strongly marked at their terminal points than in the deeper parts of the dentine.

4th. The dentinal fibrillæ are processes of the odontoblasts, and are continuous, passing from these bodies through the entire thickness of the dentine without break in their continuity.

5th. There is no perceptible material change in the appearance of the odontoblasts, from the commencement until the completion of the formation of the dentine, except that they seem to decrease slightly in size as the process of dentinification approaches completion.

6th. The microscopic evidences that enamel is not formed by a calcification of successive layers of corpuscles are more clearly shown than in the formation of dentine, there being never but a single layer of ameloblasts outside the forming enamel, and the line which separates the enamel from the enamel-formers being more sharply marked than in dentine.

7th. The method of the development of enamel and the microscopic morphology of the fully-formed tissue precludes the possibility of the existence of enamel-fibers in the sense taught by Drs. Heitzmann, Bödecker, and Abbott.

8th. The demonstrations upon which the foregoing propositions are based, and the evidences furnished by a careful microscopic study of caries of dentine and enamel, lead to the conclusion that the so-called inflammatory theory of decay has grown out of errors of interpretation, and is without foundation in fact.

In conclusion, I may repeat that the deductions to be drawn from my studies of the development and minute anatomy of the teeth in health and disease are in harmony with that practical experience, gained by careful observation, that decreased liability of the teeth to decay must result largely from change in environment; and this is to be effected by cleanliness, local antiseptic treatment by suitable mouth-washes, by giving the teeth a proper amount of work to do, and by such systemic treatment as will decrease the conditions which favor fermentation in the mouth.

DENTAL CARIES.—VI.

BY A. MORSMAN, M.D., D.D.S., IOWA CITY, IOWA.

(Continued from page 17.)

PART SECOND.—NOSOLOGY.

3. Pathology and Clinical History.

Pathology.—Has dental caries a pathology? is a *quæstio vexata.* By reference to what has been said on etiology, it will be seen that the inflammatory theory has been abandoned, and whatever pathological action the tooth takes on must be in the line of resistance to the encroachments of the malady. It is pretty generally conceded that the enamel has but little if any resistive force; that it is practically passive under the infliction. It can be readily belived that this is true when we consider how little organic matter it has to act· Supposing it had any, it could at most be but slight. Probably it has none.

Much has been said in discussing this condition about the possibility of inflammation of the dentine, as if the question hung on that possibility. I do not see that inflammation has anything to do with it. I should say that an inflammatory action of the dentine is impossible in the general acceptance of that term; but I do not see that the deposition of lime-salts in its canaliculi is by that prevented. We *know* that the pulp is irritated by external impressions. We *know*, also, that even after the tooth is formed the deposition of lime-salts by the pulp continues through life to (in old age) the almost entire obliteration of the canaliculi. (Senile dentine). This is pulp function. Can this function be augmented? Anyone who has made a practice of breaking open extracted carious teeth can bear witness to the frequency of pulp-nodules* in the pulp-cavity. I have several in my possession that almost entirely filled the cavity. What is this but increased function? According to Magitot, upon

* I have never found these nodules in any but upper molars, which seems to me very strange, as other observers have seen them elsewhere.

the inner surface of the pulp-cavity, adjacent to the carious cavity, can often be seen a deposit of secondary dentine of considerable thickness, that is adherent to the wall and a part of it. Such conditions are illustrated in his work.* I have never seen such a deposit myself.

It seems to me that no construction can be put upon these deposits save that it is increased function caused by irritation. The following case is in point. Miss L., aged 35; temperament, nervo-sanguine; in poor health; small, sensitive cavity on the anterior approximal surface of first upper molar; patient unwilling to endure any pain. *Experimentally*, I thought I would try arsenic. Made application at noon; patient to return at two P.M.; no appearance. I learned from her physician, two days later, that she was confined to her bed. I went to her residence and removed the arsenic. That was on March 27, and I did not see her again until May 25. No soreness of tooth; no discoloration; no pain on excavating. Feeling absolutely certain that the pulp was dead, I opened the cavity and found it completely filled with pulp-nodules. The tooth required no treatment, and is doing well. This was in 1884. Here, doubtless, the arsenic was the irritant that caused the deposit. Possibly this will throw some light on the occasional success (?) of this method of "treating" sensitive dentine. Granted that increased function can be caused by peripheral irritation, can the lime-salts be deposited in the fibrils as well as in the pulp? Here the microscopists must decide, and they do not agree. According to Leber and Rottenstein, the canaliculi are filled with leptothrix and micrococci. According to Abbott and Miller, these organisms are never seen beyond the limits of decalcification.

I have never seen a case of pulp calcification in teeth of inferior structure. I am therefore less inclined to believe in the theory of resistance in such teeth. If there is resistance it is in a much less degree. In a tooth of good organization, capable by reason of its structure of retarding the advance of the malady, so that the pulp, also of normal energy, is not at once overwhelmed, I believe that the zone or cone preceding the disease *is* due to the deposition of "secondary" dentine in the tubuli. I can see no reason for denying in pathology what we admit in physiology. In teeth of very inferior organization the action of the caries is too rapid to permit any conservative efforts on the part of the pulp, which is also, probably, below normality, and, never having responded to stimuli, does not do so now. In examining such carious teeth I rarely find the cone well marked.

I have devoted considerable space to this question, because in a

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* "Dental Caries," Chandler's translation.

recent essay or monograph an English writer has taken the ground that both dentine and enamel are entirely passive under the carious process, and that there is no "vital reaction." He has seemingly written for this express purpose. But one looks through his work in vain for that evidence naturally to be expected. Unless so-called "literary" expertness and tirades against, and misrepresentations of, other writers be evidence, there is none. "Language, logic, and grammar" may be the criterion of scientific knowledge in England, but in this country the worst-constructed sentence possible cannot hide a germ of truth.

He says: "Once formed, enamel is cut off absolutely from all vascular connection." Can he prove that? Does clinical evidence bear him out? Do we not *know* that enamel changes with age? Confessing that he has never made any observations, is his statement worth anything? Microscopists *do not* agree upon this point, and if he has any occult way of finding out more than they know he should divulge it.

The evidence against the theory of vital reaction is the claim that all the appearances of dental caries are to be seen in pulpless teeth and in artificial substitutes made of human teeth or ivory. While all experimenters and observers agree that the process in these cases is very similar to ordinary dental caries, they still disagree on this very point under discussion. We can only wait for more light. Until then I see nothing impossible or even improbable in it. According to the chemico-vital theory, as enunciated by Tomes and elaborated by Magitot, the irritation produced by incipient caries is transmitted to the pulp; that organ responds by increased action, and the tubuli of the dentine in advance of the carious cavity become partially or entirely filled with new deposits of lime-salts, the so-called secondary dentine. If we cut through a carious spot in the direction of the long axis of the tooth and smooth the surface, we can see a cone-shaped place with its base at or towards the carious cavity, and its apex reaching or directed to the pulp-cavity at the nearest point. Sometimes the spot does not reach either cavity, and it is then likely to be round, oblong, or oval. This cone or zone differs from the surrounding dentine in color, being of a light-brownish shade, and having an appearance of greater translucency. It seems to me to be of denser tissue and less readily scratched with an instrument than the normal dentine. It is quite evident that the cone shape is due to the divergence of the tubuli as they pass from the pulp to that portion of the periphery occupied by the carious spot, and I have never seen any radiation or branching out beyond the limits thus formed. At first the cone is a small spot appearing somewhere in the course of the affected tubuli,

usually at the peripheral extremity, from which point it gradually enlarges, extending towards the pulp. This cone, it is claimed, owes its formation to the deposition in the tubuli, molecule by molecule, of secondary dentine until they are partly or entirely obliterated. I believe this to be simply an augmentation of pulp function, and that these deposits offer to some extent a fresh resistance to the disease. That it is ever capable of arresting it, as taught by Magitot, I do not believe, *except* in cases where the environment is favorable.

According to Magitot, the deposit of secondary dentine is sometimes excessive, and then the tubuli are not only obliterated, but the deposit continues upon the inner surface of the pulp-cavity adjacent to the cone, thickening the wall of dentine and gradually encroaching upon the pulp, until it is almost obliterated and its place occupied by secondary dentine. Such a case is illustrated in his work, Plate I, Fig. 7. I have never seen anything like it, and should regard such a specimen as a triumphant vindication of the theory. My own observations lead me to the belief that the deposits in the pulp-cavity are rarely, if ever, attached to its walls; that they begin in the substance of the pulp, and are usually of irregular formation, but may fill the cavity; although rarely of one piece, being more often an aggregation of small stones. These stones are exactly like the secondary dentine of old age. They are due to the same augmented function above mentioned.

Clinical History.—Not all the surfaces of the teeth are alike subject to this disease. Of the incisors and cuspids, the approximal surfaces are the most frequently attacked. Next in order of frequency, the anterior surface adjacent to the gingival margin; and third, the posterior surface, when there is a basal ridge developed. The cutting edges and the anterior and posterior faces are but rarely attacked, and when caries does occur here it has its inception in a calcific defect.

Of the bicuspids, the first surfaces in liability to caries are also the approximal; the second are the fissures between the cusps; the third are the external surfaces at the gingival margin; and, lastly, the cusps and internal surfaces, in which caries is very infrequent. Of the molars, the first points of attack in frequency are the fissures on the masticating surfaces; the second are the approximal surfaces; and the third are the external surfaces,—first at the pit in the fissure when one exists, and second at the gingival margin; lastly, the internal surface.

All teeth have not the same liability to caries. Out of 904 *selected* cases in teeth of better than average organization, the proportion was as follows:

Superior centrals, 97; inferior, 1; superior laterals, 101; inferior, 3; superior cuspids, 37; inferior, 8; superior first bicuspids, 67; inferior, 25; superior second bicuspids, 73; inferior, 53; superior first molars, 116; inferior, 126; superior second molars, 74; inferior, 75; superior third molars, 23; inferior, 25. In order of frequency we have inferior first molars, superior first molars, superior laterals, superior centrals, inferior second molars, superior second molars, superior second bicuspids, superior first bicuspids, inferior second bicuspids, superior cuspids, inferior third molars, inferior first bicuspids, superior third molars, inferior cuspids, inferior laterals, and inferior centrals. In the upper jaw there were 588 and in the lower 316 cases. This difference is largely accounted for by the action of the tongue and the constant flow of saliva against the lower front teeth. If we eliminate all the front teeth, including the first bicuspids, we have of superior teeth affected 286, inferior 279, a difference not very great. The prevalence of caries in the first molar is accounted for largely by its environment during the first four years after its eruption, the adjacent deciduous teeth being in a large majority of cases carious; also by its special liability to errors of calcification, although I believe this feature to be largely eliminated in this tabulation. The increased liability of the second over the first bicuspids is traceable to the same cause. The first molar having become carious from the deciduous tooth, the predecessor of the second bicuspid, the latter is in turn subjected to the same influence where it is erupted into position against the carious first molar. I cannot account for the differences in the figures representing the upper and lower homologous teeth. Why should the liability to caries in the upper jaw be much greater in the bicuspids and much less in the first molars?

My observations do not entirely agree with the tables of either Magitot or Hitchcock, nor do these observers agree with each other. The total number of cases in my table is small, but the fact that they are selected cases gives them greater value.

I shall divide the carious process into four periods: first, superficial caries, in which the enamel only has been attacked; second, simple caries, including all cases in which there is no pulp exposure; third, complicated caries, in which the disease has penetrated to the pulp, and the lesions of this organ demand consideration; fourth, caries *ad finis*, where, the pulp being dead, the continued progress of the disease results in the entire destruction of the tooth.

Superficial Caries.—Beginning in some favorable locality, superficial caries appears first, if free from extraneous matter, as a minute, white, opaque spot of softened texture. In shape, as it progresses, it is variable. If upon a smooth surface, it will be almost always

round, but otherwise the form will vary with the surroundings. Occurring in a fissure or calcific defect, it takes the form of these. At the gingival margin it has usually the crescentic shape of the gum festoons. Caused by a plate, clasp, or other appliance, it is shaped by them. Occasionally it is erratic, without perceptible cause, and forms a serpiginous or branched track across the surface of the tooth. The color of carious enamel is always white, until pigment is deposited there from extraneous sources. Hence, the reason so many writers have called rapid decay "white decay," and that which was colored deeply "chronic decay." In proportion as caries is rapid, coloring matter cannot be deposited. In proportion as the malady is slow, the deposit of pigment granules will be considerable. Let it be understood that the color has nothing to do with the disease, either as to its chronicity or cause; that it is simply an acquirement from the surroundings of insoluble particles deposited among the broken-down prisms and in their central decalcified portion. It may vary from a light straw color to a dark brown, almost black; usually the spot is not uniformly colored, and it may present all the shades commonly seen. As teeth of imperfect organization decay more rapidly than others, the color of carious enamel will, in a measure, indicate the structure of the tooth. Those of good organization being more resistive, will also be more highly colored, while in very inferior teeth the carious spots will be white. The terms acute and chronic in this connection should be abandoned. They have no significance except as to time, and that is governed entirely by the tooth-organization.

If we touch a carious spot of enamel with a pointed instrument, it will penetrate it, and removing a portion with an excavator, it is seen to be a soft or friable chalky mass, damp and pasty as it comes from the cavity. It consists of broken-down enamel-prisms and débris.

It often happens that a superficial caries is arrested, as, for instance, when due to bad environment, and the cause is removed. In such a case the color remains. Such a spot is always vulnerable.

There is not often any pain attending superficial caries. Occasionally such a point is sensitive to sweets, but not often unless the dentine is slightly penetrated. In the case of its occurrence at the gingival margin, it is often exceedingly sensitive to touch or cold, frequently out of all proportion to the extent or depth of the lesion.

Simple Caries.—Having penetrated the enamel, the disease now progresses with greater rapidity in the softer structure of the dentine. The opening in the cavity may gradually enlarge, or, as is more commonly the case, it remains the same, while the cavity in its interior assumes a globular shape, modified by points of resistance

or defects of structure. Thus, if the superficial effects have been slight, there may be only a minute opening to a cavity that has penetrated to the pulp. The carious process having removed all but the enamel walls, these are too frail to support mastication, and sooner or later give way, exposing a large cavity and apprising the patient for the first time that all is not right. Such patients quite frequently come to us with the information that they broke the tooth and decay started from that cause. Not infrequently I have opened what seemed a very small cavity to find that I had a complicated case. These instances occur most frequently in inferior teeth structurally.

Caries of the dentine varies much with the variation in tooth-structure. This variation has given rise to many terms expressive of the conditions observed. Thus, we have had moist caries, dry caries, acute, chronic, etc. Moist, rapid caries is incident to inferior structure; while the dry and slow variety is characteristic of teeth better than the average. As these two conditions are essentially different in appearance, I shall describe them separately, illustrating by extreme cases. Selecting a tooth of typically excellent organization, we find that in it the process is extremely slow, its progress being represented by years. The opening into the cavity, most likely large, discloses the contents of a dark-brownish color, and of quite firm texture comparatively. In excavating, we find that the decalcified material peels off in layers, and is of a horny consistence. Of loose, disintegrated matter the cavity will be rather free, except the usual débris from foods. The contents will be acid in reaction, as indeed are all carious cavities of sufficient size to permit a test.

There is quite uniformly considerable pain in excavating these cavities, even before the sound dentine is reached. Indeed, pain has been a marked symptom, first experienced on taking sweet substances. The tooth becomes finally sensitive to cold air or drinks, and may even ache decidedly for several hours. The margins of the cavity are abrupt and well-defined, and there is but little tendency to undermining and erratic courses.

Taking now a tooth of exactly opposite character, the course of the disease is rapid and painless. The margins of the cavity are thin and frail, and are quite often irregular and jagged. It is quite common in these cases on approximal surfaces to find at the margin of the gum an extension from the main cavity of softened tissue more or less encircling the tooth. There is a great tendency to burrow, and cavities are rarely globular in shape and almost never symmetrical. The contents of the cavity are humid and disintegrated. There are no large pieces of decalcified dentine, as in the first illustration, and the excavator touches nothing resisting until sound

dentine is reached. The color of the débris is ashy gray, and it has a faintly nauseous odor. The progress of the disease is measured by months, and but few cases reach the dentist sufficiently early to prevent pulp exposure. Between these two extreme cases there is every variety of modification and characteristics of both.

Complicated Caries.—Practically, as concerns us here, this stage of the disease differs from the above description only in extent. The complications being pulp-lesions, belong rather to the sequelæ of the disease, and will be considered there. At some point in the floor of the cavity the pulp is uncovered. This usually first occurs at the coronæ, and in the bicuspids and molars most frequently at the buccal corona. In poor teeth there may still be little or no pain, but in good teeth, unless the pulp is still protected by layers of decalcified dentine, pain is a pronounced symptom. It may be induced by thermal changes or mastication, or it may be continuous, resulting finally in an inflammation that demands relief. From this time the pulp-lesions are the most prominent, and we may have inflammation, ulceration, and death.

Caries ad Finis.—Quietly, or after repeated struggles for existence, the pulp dies, and the cavity which contained it becomes a part of the carious cavity. The surface acted upon is now greatly enlarged and the destruction is rapid. Gradually the entire mass of dentine is destroyed, and piece after piece of unsupported enamel breaks down, until there is nothing but the jagged ends of the roots above the gum. The entire crown is destroyed. Below the surface of the gum, on the *exterior* of the root, the caries cannot act, but on the interior of the root it still pursues its course. The interior becomes cone-shaped, with the base outwards, and the edges very thin. And now nature aids the process by gradually throwing off, or pushing out, what has become a useless and offensive member. The root having nothing to strike against, rises from its socket, and, as successive portions appear above the gum margin, decay and attrition remove them, until finally, attached only to the gum, it is picked off or exfoliated. This period is a very long one, extending over a number of years, perhaps nearly a lifetime. Sometimes the root does not rise from its socket, and then the apex of the root is never reached by the disease. Abscess, ulceration, and necrosis are incidents of this period. Pain may exist at times, but it is not due to the caries. When it does occur it comes from periosteal complications. Often the patient is entirely unconscious that there is a root in the mouth, or, if conscious of it, suffers no annoyance therefrom.

(To be continued.)

PRINCIPLES AND METHODS OF FILLING TEETH WITH GOLD.

BY A. G. BENNETT, D.D.S., PHILADELPHIA, PA.

To the question, "What is the most urgent need of dentistry to-day?" several answers may be given. Perhaps few will dispute the assertion that our great need is scientific knowledge—exact and exhaustive—of the structures and materials, the pathology and therapeutics, involved in saving teeth. No one doubts that "the need of the profession of the age is to know;" but that "our mechanical ability has outrun our scientific attainments," may be considered a debatable question. To what extent have we been able to utilize our knowledge of dental anatomy and physiology in saving teeth? It is true that our most successful operators have usually been and are the best educated; yet skill, after all, is the one thing needful to give any meaning or value to knowledge in practical dentistry. Dr. Thompson claims that "it is most imperative and important that we better understand *why* we perform our operations; the *how* will follow of itself. Filling a hole in a tooth is an absurdly simple thing to do,—a mere mechanical and artistic performance." The *why* we fill a tooth has never been considered much of a mystery. The tooth cannot resist decay nor restore the lost portion,—in short, it cannot fill itself. Again, what is the value of "scientific reasoning," as opposed to experimentation? Is it not a fact that all theories and supposed principles are established or destroyed by experimentation and experience? Again, Dr. T. claims that we are not scientific because the lost parts are not restored in natural substance. There may be such a thing as "striving after the unattainable."

As long as the operation of filling a tooth is slightly surgical and largely mechanical, so long there will exist a greater necessity for developing skill than for acquiring knowledge. How many educated dentists are guided in operating by the structure and functions of the dental tissues? The enamel-rods, the living fibers, the nutritive currents receive little or no attention, or must yield to mechanical requirements.

When all is summed up, it must be admitted that, though one *should* have the learning, he *must* have the skill. It has been not unfrequently more than hinted that some operators who can talk fluently and write elegantly on saving teeth are unable to make even a presentable filling.

Filling a hole in a tooth may be an absurdly simple thing as regards mechanical principles, especially if the tooth is to be thrown into the operator's drawer,—and simple enough, even, when the tooth is exposed to the forces and fluids in the mouth, if the object be merely to insert the filling so that it will be retained till it decays

out; but to insert a gold filling in such a manner that the tooth will resist, for say ten years, all chemical, thermal, and perhaps electrical, forces to which it may be exposed is quite a different thing.

Our text-books on operative dentistry, though treating the subject of filling in detail, give space and importance to certain features of the subject out of proportion to their relative value. For instance, Taft dwells at great length on the preparation of cavities by classes and their modifications, and on the various forms of gold; yet gives comparatively little exact information and few definite directions on the most essential of all points,—the adapting or packing of the gold against the walls and around the margins of the cavity. No one doubts or denies the fact that proper preparation of the cavity is the basis of a perfect filling; but, after all, the adaptation of the gold to the dentine and enamel surfaces is the essential requirement. This is trite enough to those who use gold successfully, but it has not received the general recognition which its importance demands. Adaptation is the vital point, for the obvious reason that defects, even the smallest in the cavity, can readily be seen, with or without a magnifier, and removed, while defects in packing the gold are more or less concealed from view, and generally cannot be corrected except by taking out all or a part of the filling.

Some one remarks that it is difficult, if not impossible, to adapt two hard substances such as dentine and extra-cohesive gold to each other so as to form a moisture-proof joint; hence the necessity of having as much softness in the gold as is consistent with the required cohesion; and hence the necessity of an even, smooth wall; for, since adaptation to such a wall is difficult, it is obvious that it is well-nigh impossible to adapt gold against rough, uneven surfaces. It is clearly impossible to force gold into the minute inequalities of dentine and enamel. In short, as some one has said, a filling should resemble a cork in a bottle rather than a ground-glass stopper.

Though the essentials of successful tooth-filling are more or less familiar to all, yet, as a basis for what is to follow, they will bear repetition. "It has been said," remarks Dr. Atkinson, "that almost anybody can make a filling moisture-tight; almost nobody does. If the cavity is properly prepared, you will have no difficulty." The expert few may have no difficulty, but the unskilled many, even with a perfectly prepared cavity, will often fail of success.

To prevent breakage and leakage, and because a tooth is partly an animal tissue, and not wholly a mineral substance, the following are the essentials for cavity preparation:

1. A cavity should be so prepared and its border so bevelled that when filled the tooth will offer the greatest resistance to mechanical and chemical forces.

2. Complex cavities should be so simplified and their parts made so accessible that the filling material can be readily and certainly adapted to their walls.

3. Approximate cavities, which extend to the excising edges or occluding surfaces of the teeth, should be so prepared and filled that the strength of the operation will be equally divided between the tooth and the filling.

4. The walls of a cavity should have no corners or acute angles, and should, when possible, form the segment of a circle; and the bevel of the enamel should, as far as may be, conform to the line of its cleavage.

5. Smooth, strong walls, secure anchorage, and perfect adaptation of the filling material to the tooth-bone are the essentials of durability.

6. As regards the enamel, it is better to remove too much than too little; as respects the dentine, better to remove too little than too much; and as to the anchorage, it had better be too deep than too shallow.

7. Anchorage should be secured by so combining pits and grooves as to do the least injury to the dentine and give the greatest strength to the filling; and the enamel should, when possible, be supported by living dentine.

And, to sum up, smoothness of surface and softness of material insure closeness of adaptation.

A few words on the final preparation of approximal cavities may not be amiss. Dr. Jack's idea that a groove-cutter should have a rounded edge is certainly a good one. A concave floor to the groove gives greatest strength, besides being exactly adapted to a convex surface on the plugger. After grooving, take a sharp spoon excavator of the proper size and remove the fine edge from the margin of the groove. With a chisel excavator cut and scrape the cervical wall till all softness of the dentine and roughness and whitish appearance of the enamel have been removed; then polish all accessible surfaces.

Much as opinions and theories may differ in regard to the various forms and methods of using gold, all successful operators are agreed that softness of the metal is the essential property for tooth-preservation. The value of the cohesive property, essential as it is for contour work and in restoring crowns, has been overestimated, and to many it has proved a delusion and a snare, because of easy welding and difficult adaptation. Who has not observed and admired the beautiful working of this gold; yet how few have noted the fact that its adaptation could scarcely be worse. To many for years the cohesive property contained the "promise and the potency" of all

that is "ideal" in the perfect filling material. For those who claimed that if a tooth was worth filling at all it could be filled with gold, and then proceeded to fill all cavities without regard to the quality of the tooth-bone with cohesive gold, there could be nothing but ignoble failure. Some few expert manipulators of cohesive gold have attained phenomenal success; but of some of these one can truly say "they did not live to see their wrecks," their careers being cut short by too intense devotion to their golden idol.

If there was nothing more difficult in operative dentistry than the welding of cohesive foil, even when one end of the mass is anchored in a carious cavity, the record of failures would form a small part of dental literature. Those who have regarded the cohesive property as something of a marvelous mystery seem to have lost sight of the two facts that cohesion is an inherent property of all metals, and that gold when pure and clean welds cold simply because it does not oxidize. Had the value of softness in cohesive gold been noted and understood sooner, there would be less reason to be lost in wonder that teeth decay so readily and so rapidly around gold which worked so beautifully. True, cohesive gold is relatively soft and ductile, and when used in the form of ribbons, even though made from heavy foil, some operators have no doubt been able to "swage" and "strap" and "band" it beneath and over and around the frail enamel walls of even delicate laterals; but the inherent ability and acquired skill to do these things have been given to the favored few.

The best gold is not always "that which can be worked the most easily, rapidly, and perfectly," but that which can most safely and certainly be adapted to dentine and enamel walls. Extra-cohesive gold may not work the most easily, but it certainly works the most rapidly, as large pieces and many thicknesses can be used under a broad plugger; and it works perfectly, since it makes a mass which is securely welded; yet the adaptation may be most defective.

Not many will dispute the assertion that few gold fillings are absolutely perfect. Most of them have two kinds of defects, visible and invisible; the former being of course around its margins in the enamel or gold, and the latter at any point over the entire surface of the cavity. As the condition of the cavity can be readily seen and the kind and form of gold selected, the causes of these defects can be narrowed down to the instrument and its proper or improper management.

1. It may be laid down as an axiom that pluggers should be so constructed and gold used in such a manner as to exclude, with the minimum of time and attention, all defects which from their nature cannot be detected by the eye.

2. Not only the shape of the tooth, but mechanical requirements,

as well as esthetic considerations, demand that the walls of a cavity should generally form the segment of a circle.

And if their form be not a matter of mere fancy, the size and shape of end and curve of shank in filling instruments must be determined by and adapted to the size and shape and position of the cavity.

3. Owing to the position and condition of cavities and teeth, gold is adapted to dentine and enamel surfaces *directly* or *indirectly*. When the walls are strong enough it should be adapted directly, and when the walls are weak or the tooth frail it must be adapted indirectly,—or, in other words, spread or wedged against the walls. This determines that there are essentially two kinds of pluggers,—one for direct, the other for indirect, adaptation.

4. The cavity walls, especially the cervical, being concave, requires that the face of a "direct" plugger should be convex, to secure perfect adaptation; and this form of face, besides, will insure thorough condensation and welding more certainly than a flat surface, because of the difficulty of holding two flat surfaces squarely against each other.

5. Experiments prove that gold will spread only under a convex surface, either smooth or serrated transversely, the instrument when serrated being so held that the cuts or valleys are at right angles to the cavity wall. Pits and grooves as well as small cavities and fissures admit only of indirect adaptation; hence "indirect" pluggers for these should always have a convex face, serrated in one direction only, so as to spread the gold slightly but firmly against the walls. "Direct" pluggers, when used within the cavity, may be serrated one or both ways; but when used beyond the walls they should be serrated in both directions, for the reason that here spreading of gold would be a detriment rather than an advantage.

6. "Direct" pluggers are generally of the foot shape, and consist of two kinds,—one short and relatively thick, the other long and thin; the short being used within the cavity and beyond its walls, as in restorations; and the long being intended to complete the filling where space is limited, as between the front teeth. The end of an "indirect" plugger is usually small, and may be round, oval, or flat.

7. In regard to serrations, it may be observed that they answer two objects, viz., prevent slipping and leave a rough surface. Smooth points, though they spread the gold, have been tried and found wanting, because by slipping slightly they burnish the gold, thereby damaging if not destroying the cohesive property.

8. Smooth convex points, besides spreading the gold, prevent pitting and porosity. Small points serrated both ways effectually prevent spreading, besides tearing and cutting up the gold; but

convex surfaces cut one way combine the good qualities of both kinds without the defects of either. When soft gold is packed like tin, of course the serrations must be deep, and the plugger should be cut both ways, so as to secure sharp points to interlace the metal; but when the cohesive property is utilized, no one will now claim that the serrations are intended to cut through and interlock the gold.

9. The pitting or porosity caused by serrations is reduced to the minimum by having the pluggers cut fine. As pluggers of the foot shape are seldom available for indirect adaptation, and because of their relatively large surface do not cut up the gold, they should always be serrated in both directions; but no good reason can be given why a small "indirect" plugger should be cut both ways.

The writer has devised a set of pluggers based on the foregoing principles and theories, which he has endeavored to verify. These points are the result of a number of experiments undertaken with the view of determining the best form of face and kind of serrations for making a moisture-proof joint with the least risk of injury to the tooth-bone. These points are so shaped and serrated that some if not all of the common and usually invisible defects can be excluded with a good degree of ease and certainty, and that, too, without unduly taxing the time and attention of the operator.

This set of pluggers consists of modified and original forms. There are five ordinary round and one flat point, and six foot pluggers, three short and three long; and it is believed that these in connection with the most useful hand-pressure points will enable the operator to reach every cavity that can be entirely or partly filled by mallet force. This set of instruments was illustrated in the DENTAL COSMOS for October, 1885.

A few words on the automatic mallet, for which these points are intended, may not be amiss. The blow of the Snow and Lewis automatic mallet, which is justly regarded as the best, is a little too sharp and painful for the safety of the enamel and comfort of the patient. These defects are easily removed. It has been the habit of the writer for some years to put a drop or two of castor-oil on the end of the mallet, which is done by taking it out of the case. The blow is modified partly by some of the oil remaining on the upper end of the plugger-socket, and partly by some of it gradually working in around between the mallet and the case, thereby retarding the descent of the former and increasing its effectiveness; for the blow seems to combine all the good qualities of steel and lead without their objectionable features. Besides this, the working parts of the mallet should be occasionally lubricated with engine-oil. Owing to the strength and temper of the spring, all mallets cannot be equally modified by the method just described. To save time and

avoid changing points, the operator should have two or three automatic mallets, or it should be used in combination with the hand mallet.

In concluding, the writer would say that, though these points may not be perfect as made, it is believed that it can be demonstrated that they embody the correct principles.

A SYSTEM FOR COLLAR-CROWNING AND BRIDGE-WORK.

BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

THE object of this paper is to present as briefly as may be, and without discriminating as to the new or old features, what I have termed a system of crowning and adapting gold collars for crowns, or for bridge-work.

To illustrate: Given the sound roots of an inferior molar which it is desired to crown,—previous treatment having brought it into a

FIG. 1.

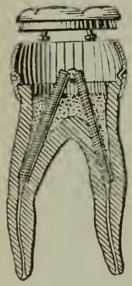


FIG. 2.

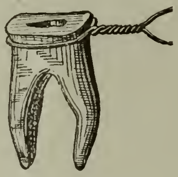


FIG. 3.

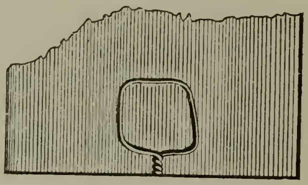


FIG. 5.

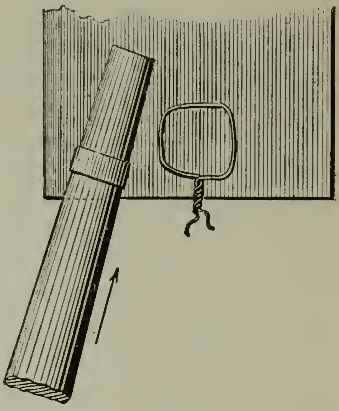
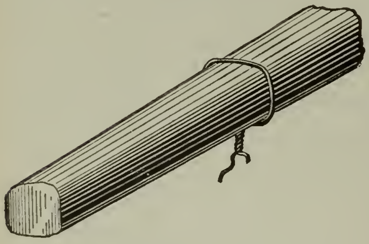


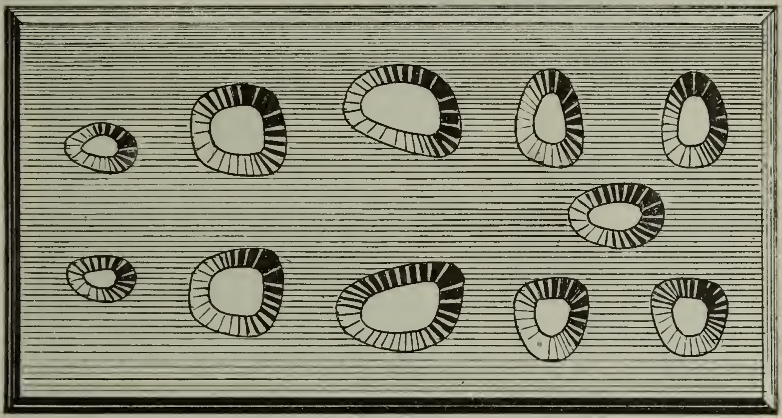
FIG. 4.



suitable condition for the operation. Trim and smooth the cervical margins; enlarge the pulp-chamber, undercut its walls, and fix in the root-canals two screw-posts so that they will slightly project from the chamber (see Fig. 1). Secure a measure of the root by a piece of No. 26 binding-wire, twisted, as shown in Fig. 2. Lay the wire-loop thus formed on a block of lead, and with a broad-faced

hammer drive it into the surface of the lead so as to secure an accurate impression (see Fig. 3). Place the loop on a suitable molar mandrel (see Fig. 4). Measure with a wire around the mandrel just in front of the loop, in order to obtain the precise inside circumference of the collar required. Make, or select, a collar of the requisite size and proper width for the case; place it on the mandrel; hold both on the lead block (see Fig. 5), and with light taps of a suitable hammer conform the collar to the mandrel until the wire loop will just fit snugly on the mandrel, *close* in *front* of the collar. That edge of the collar should then exactly fit the impression of the loop in the lead; if not, it may be made to fit by the judicious use of pliers; but, if found too large for the root, put the collar in the proper hole of the contractor (Fig. 6); cover it with a piece of hard sheet

FIG 6.



metal, and strike the metal with a hammer for the effect shown in the sectional Fig. 7. By these means a perfect fit of the collar on the root neck may be quickly obtained. The collar may be contoured (see Fig. 8) by using the peculiar pliers illustrated by Fig. 9. The same pliers, by turning aside the pivoted plate, will serve to punch projections on the inner surface of the collar, as in Fig. 10, to prevent it from slipping too far on the root (see Fig. 11). A suitable cap may now be soldered on the collar, and the crown may be attached to a bridge, or mounted as usual. The new seamless collars are more perfectly adapted, smoother in finish, and need not be invested when the cap is being soldered. A porcelain cusp crown renders unnecessary any soldering, and is illustrated in Fig. 12.

After the collar has been fitted and adjusted, as has been previously described, a cusp crown is placed in the collar and the proper occlusion obtained by grinding either the cusps or the top edge of

the collar with engine corundums. Then all moisture is removed from the root, collar, and porcelain; the collar put over the root, and plastic cement, or thoroughly softened gutta-percha, quickly packed into the collar and around the screw-posts, until the collar is nearly filled, and a little of the plastic material is placed around the platinum pin. It is then pressed into place; preferably by the occluding tooth. The surplus plastic material will exude between the collar and the porcelain, and the joint will be imperceptible if the operation has been skillfully performed. The final finish can be given after the cement has become hard. Fig. 13 shows such a completed crown. Fig. 14 illustrates a modified cusp crown, the sloping sides of which admit

Fig. 7.

Fig. 8.

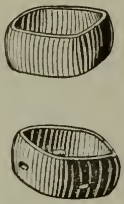


Fig. 9.

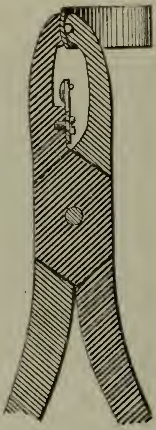


Fig. 12.

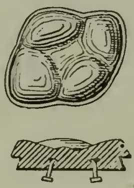


Fig. 10.

Fig. 11.

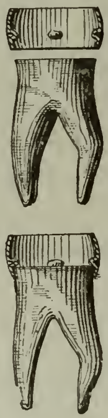


Fig. 14.

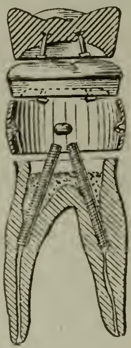
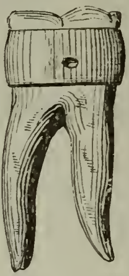


Fig. 13.



of oblique adjustments for occlusion without grinding off the cusps of the crown. At first thought it might appear as though the various sizes and shapes of the necks of teeth would compel the possession of a very large variety of mandrels to meet the needs of practice; but the fact is that the several classes of teeth have certain generic forms which admit of such grouping as to reduce the number of mandrels to seven as to shape, while variations in size are provided for by suitably tapering the mandrels.

This system simplifies the manipulative process of collar-crowning as designed for either a single tooth or for the tooth-abutments

of bridge-work ; and, while lessening the consumption of valuable time, it also increases greatly the expectation of durability by reason of an assured adaptation of the collar to the root-neck, and a consequent firmness of the crown attachment.

SPREADING THE DENTAL ARCH.

BY E. S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

In spreading the dental arch the majority of cases require the greatest pressure on the anterior teeth, and an appliance which can be placed inside the arch will exert the greatest influence. The force is equally distributed on both sides of the mouth, and if constant the work will be accomplished rapidly, without inconvenience to the patient. Such an appliance is here illustrated (Fig. 1). It is used in the mouth of a young woman fourteen years of age. A plate is made to fit the teeth and alveolar process, and cut away so that

Fig. 1.

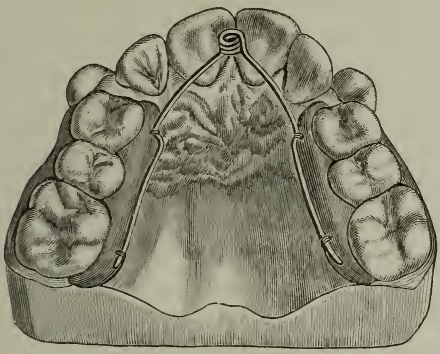
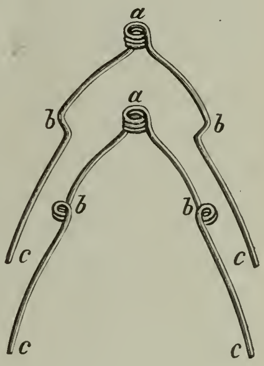


Fig. 2.



the anterior parts extend far enough forward to inclose the teeth to be moved. A piece of wire is bent into either of the forms shown in Fig. 2, wherein *a* is the coil and fixed point, and *b b* movable arms extending from *a*, and also fixed points; *c c* movable arms extending from *b b*.

Grooves are cut into the anterior and posterior parts of the plate to correspond with and receive the points *b b* and *c c*. Holes are drilled at these points, and the wires tied to the rubber plates. In order that the anterior teeth may be moved with the greatest force, the arms are so adjusted that the greatest pressure is exerted on the anterior parts of the plates. This appliance is readily removed for cleansing, and returned to place, by the patient.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting, Tuesday evening, November 10, 1885, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. William Jarvie, in the chair.

Incidents of Office Practice.

President Jarvie. I understand that Dr. Atkinson presented a very interesting case at the last meeting of the First District Society, and we would be pleased to learn how it is getting along.

Dr. Atkinson. Mr. President and Gentlemen: It is a very interesting case, and is progressing finely. The patient referred to is a young girl who has been in the hands of medical men for seven years, and for five of those years with a large fistula at the symphysis of the chin. I wish to emphasize what I have so often said, that it is necessary for us to be acquainted with the tissues we are dealing with in order to make diagnoses, prognoses, or a cure. The little girl was eight years old at the time her little brother struck her in the mouth with a stone and ruptured the pulps of the inferior central incisors. She was put into the the hands of a medical man, and poulticing was resorted to until the abscess burst at the junction of the permanent and variable parts of the jaw-bone at the ends of the teeth. Her health was not very good, and she was treated for blood dyscrasia for seven years. At the end of that time the mother, seeing the child beginning to bud into womanhood, felt solicitous about her welfare,—a fistula discharging at the chin being neither pleasant nor attractive under any circumstances,—and asked her physician, whom she spoke very kindly of, how long this was to last. He said he would think over it and report. In three weeks he gave her a letter to a renowned surgeon of this city, who told the lady he would confer with her doctor. She was finally advised to take the child to her dentist and have him extract the teeth, and told that, if at the expiration of three weeks her daughter was not well, she must come and have an operation performed. The mother took her child to the dentist, who said he was not willing, without the concurrence of a gentleman whom he desired to consult, to remove the teeth. He was then asked if the physician's opinion was not sufficient authority to warrant him in extracting them. He still declined to do it, and gave the mother a letter to me. She came with the child, in great solicitude and disturbance of mind, and with her confidence in everybody almost gone. I told her that she might

set her mind at rest, and to bring her dentist and her doctor, if she could, the next day, and we would see about saving the teeth and the child's appearance. If you ever saw a happy woman in this world she was happy, for she believed what I said, as patients usually do believe us when we know what we are talking about and are in earnest. The child came the next day with her father, and while I was getting a history of the case and its treatment Dr. Harries came in. I told him I would take care of the surgery and he must care for the teeth; that it was necessary to open down through the incisors, but that he might defer it until he should go to his office, or I would do it. He said he preferred to have me do it. I drilled through the length of both central incisors and into a pocket at the roots of the teeth. I there felt dead bone, which we always recognize so readily, and drilled through it into the living tissue; then pumped creasote and oil of cloves through the canals until it oozed out of the fistula. The fistulous tract was then dressed with cotton wet with oil of cloves and creasote, and the child was instructed to allow Dr. Harries to change this dressing each morning for two days, and to come to me on the second day; which was done. With a bastard-cut bur in the engine, entering through the fistula, I burred out the necrosed bone and washed out the débris. We dressed it with wine of opium, and left a pellet of cotton in the cavity for the purpose of keeping it open wide enough to insert a sterilized sponge the next day. After the sponge was inserted we cut a piece of adhesive plaster star shape, leaving a hole in the center to allow of the weeping out of the serum, and attached it over the wound. On the fourth day after the insertion of the sponge it had caught all around, and there was no sign of pus anywhere except upon the fatty portion of the chin. To-morrow I expect to see granulations through the sponge if there be any of the sponge in sight. That case is a typical one, and is satisfactory to me, because it is no longer discharging pus. When it is necessary to open the gum in such operations for the purpose of burring out diseased bone and inserting a bit of sterilized sponge, I place a bottle of crystals of carbolic acid into hot water so as to melt them; then saturate a bit of cotton, on the end of a gold probe, with the fluid, and touch the gum until it whitens. The gum can then be cut without the patient knowing anything about it. In some cases the sponge is left projecting a little, and afterwards clipped off down to the new granulations. Many times there will be no sponge in sight, which I attribute to my improved understanding of the matter of sterilizing the sponge. My former operations sometimes showed bits of blackened, rotten sponge coming out. In sterilizing it is not necessary to carry the heat above 130 to 160 degrees in order to completely

destroy all microbes, and that temperature will not so affect the sponge-fiber as to prevent the blood forming a nice clot.

Dr. F. Y. Clark. What was the age of the patient?

Dr. Atkinson. She was about fifteen.

Dr. Clark. Do I understand that you drilled through the incisors?

Dr. Atkinson. Certainly.

Dr. Clark. Did you ever have trouble following that operation?

Dr. Atkinson. Never.

Dr. Clark. What is the size of the opening you make?

Dr. Atkinson. According to the tooth. I use a drill large enough to include the size of the natural canal; then pump in some antiseptic until the medicament is seen coming out of the fistula.

Dr. Clark. I should have attempted to get it through without drilling.

Dr. Atkinson. That shows a want of understanding of the nature of the case. Those pulp canals are a little wider above than they are below, and are nearly cylindrical. We want to be sure that all the walls that have microbes in them are completely disinfected; that would be to your mind, being such a pronounced bacterian, a correct judgment; and the disinfectant could not be thoroughly pumped through without enlarging the canals. If we will but remember the anatomy of the parts, we need not make a mistake about it, for if we do not involve the side of the root by going through the cementum there will be no difficulty.

Dr. Clark. I think that, when the disinfectant is seen coming out through the fistula, it would be positive evidence that the affected territory had been reached.

Dr. Atkinson. Certainly that would be good evidence that the tract had been gone through, but it would not be sufficient if there were a concealed pocket there.

Dr. Perry. I certainly agree with Dr. Atkinson in regard to drilling through the foramen in such cases as he has spoken of. Formerly I had a great deal of hesitancy about doing so, having a fear of disturbing the parts too much; but after I began to appreciate a little more fully the fact that at the end of such a root there is often a nest of microbes, I saw the necessity of going through in order to thoroughly break it up. I do not know how that can be done in roots with small foramina, except by boldly drilling through the tissue until you get fresh blood, as Dr. Atkinson has for many years advised. I have been many times suprised to find how kindly those cases have behaved and how successful they were, while before I had adopted that method and attempted to get the medicines through the narrow natural opening, as Dr. Clark suggests, I was not able, sometimes, to correct the diseased condition. Another thought

should be borne in mind in this connection,—we ought not to look solely into the canals of teeth long dead for microbes, but into the dentine as well. I would drill or cut out a good portion of the softened dentine toward the apex of the root, and fill the canal with an indestructible substance. By so doing we have a better opportunity to deal with the septic conditions, and shall be more certain of obtaining the best results, which could not be obtained many times in any other way. It is necessary that a liberal supply of the antiseptic medicines shall reach the seat of the trouble. It is gratifying to me to find that the "bacteria theory," so strongly advocated by Dr. Clark, is making headway. It may be remembered that some years ago, in a paper read before this society, on the treatment and filling of roots of teeth long dead, I took the ground that microbes were the enemies we had to fight; and I am more than ever convinced that unless we thoroughly disinfect and mummify the roots of devitalized and abscessed teeth before filling, we need not hope for permanent success. I believe that the treatment and filling should be with the view of stopping the putrefactive process, and consequently of shutting off the possibility of further microscopic growths in and around the roots of the teeth.

Dr. Clark. I fear that I was a little misunderstood. I fully agree with what Drs. Perry and Atkinson have stated, that it is absolutely necessary to break up this pocket at the end of the root. Where there is a fistulous opening I can generally do that by forcing my preparation through the tooth until it comes out of the fistula. I have never seen a recurrence of abscess in any case where I had forced my preparation through the fistulous opening. Where this cannot be done I resort to drilling; but there is not one case in twenty where I cannot get it through without. I must say that I think we are advancing. A few years ago, when bacteria and septic and antiseptic conditions were mentioned in this society, I think there were a great many who laughed at me. I think we are advancing, and I do not know when I have felt as well pleased as I do to-night that such men as Drs. Atkinson and Perry should say what they have.

Dr. Peirce. If it is in order, I would like to mention a little practice that is coming to be more in vogue every year, and I think with some advantage to both patients and practitioners. It is that of extracting abscessed teeth and replanting them. Four weeks ago a gentleman came to me suffering considerable pain in the right inferior lateral incisor,—there being a great deal of inflammation with some pus oozing out on the lingual surface. I extracted the tooth, cut off the end of the root, cleaned out the canal, and saturated it with a little iodine and carbolic acid. After washing out the cavity

with warm water, I reinserted the tooth, tying it fast to the adjacent teeth. In two weeks the ligatures were removed and the tooth was perfectly well. The same morning, by a singular coincidence, another gentleman came in with a like tooth, an inferior lateral incisor, in a similar condition. In that case I drilled into the tooth in the usual manner and cleaned out the root. That is still under treatment. Both were sound teeth, and both had their pulps devitalized by concussion. In our clinics at the college I have the opportunity of performing this operation more frequently than one would in private practice. Out of five or six cases of that kind I have had only one failure, and that was due to the fact that the process had been absorbed before I extracted the tooth. These teeth we can often treat more successfully in this way, and with less labor, and much less pain to the patient, than by the old method. I will add that I do not fill the pulp canals, but after cleaning and disinfecting them I plug them at the apex with a bit of wood.

Dr. Atkinson. How long has any such case as that been under your observation?

Dr. Peirce. The first cases that I had of that kind were teeth that were knocked out, the patients coming to me with the teeth in their hands. In one case a lady came in whose inferior incisors had been knocked out, and as she had left them where she fell, I told her to go and find them. She came back with them in half an hour, and I put them into warm water, clipped off the ends, plugged up the foramina, and reinserted them. That was five years ago, and they have remained.

President Jarvie. Gentlemen, Dr. Brockway has a paper upon the rubber dam, which he will now be kind enough to read.

Dr. A. H. Brockway then read the following paper on

The Rubber Dam.

The subject upon which I propose to speak very briefly this evening will doubtless seem to most of those present a very trite and profitless one. My main excuse for venturing to present it must therefore be the very brief time which I have had at my disposal since being notified that something was expected from me on this occasion.

In looking over the contents of the dental journals of twenty years ago and more, and in reading the discussions of the dental societies of the time, it will be noticed that a never-ending topic was that of "keeping cavities dry." As every one engaged in worthily practicing the profession of dentistry felt the need of securing such a condition, in order to obtain the best results, it is not sur-

prising that the matter was considered so important. Various were the methods and devices employed; all of them unsatisfactory and exasperating alike to operator and patient in many cases. But when, by a happy thought, the rubber dam was brought into use, all or nearly all the difficulties and perplexities were overcome. It is not too much to say that this device, simple as it is, has been one of the most important and valuable contributions to operative dentistry that have thus far been made. By its proper use not only is the discomfort of the patient lessened, but the mind of the dentist being relieved of all anxiety regarding the encroaching fluids, and his hands from the necessity of holding anything in place, a much higher quality of operations is possible than could otherwise be attained.

I have said by the *proper* use; and I am constrained to say that observation has shown me numerous cases, both in public clinics and private practice, where the manner of its employment fell far short of what should be implied by that term, and where as used it secured but a temporary and doubtful advantage. To many dentists the application of the rubber dam seems quite a formidable affair, often taking several minutes to accomplish,—vexatious alike to themselves and the subject of their manipulations. I have seen ten to fifteen minutes spent in the operation, when I felt that by right methods it might have been applied in a mere fraction of the time, at only a modicum of discomfort to the patient.

Let me now in a few words give my ideas as to how it should be applied, not claiming that my methods are in any sense original, or denying that they may be inferior to those employed by many others.

To begin with, a certain kind of equipment is necessary, without which it will be impossible to achieve the best results; namely, a good quality of sheet-rubber of medium thickness, and preferably of dark color; punches of at least three sizes, for making the holes; suitable clamps and holders, with which to retain the rubber in position, and, most important of all, an *assistant*. Now, I am aware that I shall be met right here by the objection that most operators employ no assistant at the chair. I can only say in reply that in my judgment they are thereby making a very great and costly mistake. I think it is clearly demonstrable that a proper assistant would add to anyone's efficiency from fifteen to twenty-five per cent. However, I shall not allow myself to further digress on this point, as I am strongly tempted to do, but I beg all whom it may concern to consider whether they can afford to forego such an advantage.

I have said that a dark-colored rubber is preferable, and I will

give my reason by relating a bit of personal experience. Some years ago I saw advertised an article of white rubber, and thinking this would be a decided improvement, I sent for a quantity and tried it. Great was my disappointment. The process of whitening had seemed to injure its elasticity, making it more difficult to adjust. But a more serious objection was its lack of contrast with the color of the teeth, which gave the parts to be operated upon a blurred appearance. A word as to the manner of making the holes in the dam. Nothing simpler or better has been found than a hollow steel punch. A form devised many years since by Dr. F. W. Dolbeare—in which three sizes are set on the respective points of a triangular plate—is as convenient and effective as can be desired, and makes all the costly and elaborate punches which have since been brought out worse than useless.

I will not stop to speak of the forms of clamps or holders to be used, further than to say that such a clamp should be selected as will hold the rubber well away from the tooth without needlessly pressing upon the gum; often one having a little lug upon the jaw, to prevent it from slipping down upon the neck of the tooth, will be found very serviceable.

To illustrate the method of applying the dam, let us suppose that the operations are to be made upon the second and third molars of the lower jaw, left side. The first step should be to carefully pass a bit of waxed floss-silk between not only those teeth but also all those anterior to them, around to the right inferior cuspid, noting and removing any accumulations of tartar. Observe the relative positions of the teeth, whether any be greatly out of line, or if there be unusual space between them, so as to allow for these peculiarities in making the holes in the dam. Selecting a piece of rubber about eight by ten inches in size, spread it out upon the back of your Cosmos, and punch the hole for the third molar some three or four inches from the upper and at least two inches from the right-hand edge of the piece,—punching in succession the holes for the remaining teeth around to and including the incisors; using the largest size punch for the molars, the second size for the bicuspids and cuspid, and the smallest for the incisors. It will be noticed that in normal cases this will provide for inclosing ten teeth, and the objection will perhaps be made that this is unnecessary and will take needless time. Many are content with covering the tooth to be operated upon and one or two of its neighbors; but I think this is unwise, because a proper freedom of view of the parts cannot thus be obtained, and the time required to make the additional holes and slip the teeth through them is so little as to be scarcely worth considering.

Having made ready the dam, the under surface in the line of the

holes should be touched with a bit of wetted soap, which will greatly facilitate its adjustment, and the operator, taking his position nearly behind and a little above the patient, should slip the rubber first over the right lateral incisor, and in succession over all the other teeth, being assisted in this by the attendant with waxed floss-silk. Reaching and inclosing the third molar, the operator should hold the dam in position while the assistant slips over the tooth a proper clamp. The free edges of the rubber should now be drawn and held back from the corners of the mouth by a suitable holder,—such as Dr. Perry's or Lewis's,—and any loose edge likely to interfere with a good view of the work should be fastened down with a small weight. Where it is necessary to expose the neck of a tooth, a ligature of waxed floss-silk should be tied around it, and to the free ends a weight attached. If the ligature be tied with a surgeon's knot, it will retain its place. I must speak in condemnation of the practice of tying several teeth besides those to be operated upon, and leaving them in this condition for hours. It is needless, and can scarcely fail to be injurious. Should the rubber be inclined to slip from any of the teeth, a better way to prevent it than to ligate, as described above, is to tie a small piece of punk to the end of a ligature and draw it between the teeth at the point needed. Still another way is to warm a piece of wax, or a mixture of wax and gum damar, and press it against the teeth so as to make it stick, thus holding the rubber; care being taken to have the teeth to which it is applied quite dry. This preparation is also very useful for stopping any puncture that may accidentally be made in the dam.

Having for the sake of clearness described the application of the dam in this particular location and condition, it is only necessary to add that, with slight modifications, the same procedure may be adopted in other locations; the idea which I wish most strongly to impress being that of securing ample room and light, with the least possible annoyance from obtrusive folds and flaps. To some it may appear a formidable undertaking to adjust the dam in the way I have described, but practically it is extremely easy, requiring on an average certainly not more than two or three minutes of time, a measure vastly disproportioned to the advantage gained.

In conclusion, let me give a practical suggestion as to the removal of the dam. When it has been retained for some time, as is often the case, we have all found this procedure not a little difficult and to the wearer unpleasant. Before attempting it, therefore, wet the exposed and dried teeth with mild soap-suds, slightly warmed; the rubber will then slip from its place without an effort, and your patient shall "rise up and call you blessed."

President Jarvie. Gentlemen, this is a very practical subject, treated in a practical manner. The subject is open for discussion.

Dr. Perry. Two points in the paper please me greatly. One is Dr. Brockway's practical way of putting on the dam, by beginning in the front part of the mouth and working back until he gets to the wisdom-tooth. I am also glad to hear him condemn the practice of ligating the teeth. Often at clinics I have seen the ligatures drawn under the festoons of the gum of several of the adjoining teeth in such a way as to be very painful. I think that this is entirely unnecessary.

Dr. La Roche. For many years I have used in nearly all operations a double thickness of thin rubber dam, punching the holes for the teeth through both pieces. I consider this method a very safe one, for, if a break is accidently made in the upper layer, the under one is still intact to exclude the moisture. I do not agree with the essayist that it is well to include a large number of teeth in the dam, as I consider the chances of leakage and consequent trouble increased thereby.

Dr. Clark. I wish to add one point in connection with the paper just read, which I think will be found quite valuable, and that is the use of cocaïne. It is often a very painful operation to properly place a ligature about a tooth that is decayed far under the gum. It is necessary to force it down, and the patient is made very uncomfortable thereby. Lately I have been doing it without pain. A few drops of the ten per cent. solution of cocaïne, applied to the gum before the rubber is put on, will enable the operator to crowd the ligature even to the edge of the alveolar process without giving pain; or, as is sometimes necessary, to slit the gum in the vicinity of the cavity, and draw the ligature and rubber below the flaps. By means of this valuable remedy we are able to keep many cavities dry in the mouths of patients who would be unable to bear the great pain sometimes given in the application of the rubber.

Dr. Perry. I have found cocaïne of immense value as a local anesthetic before applying the dam under the gum. One use of the rubber dam I do not remember to have heard referred to in a dental meeting, and I was surprised the other day to hear a gentleman who has been long in practice say that he had never heard of it. A piece of the dam is folded inside a napkin, and the napkin is then used in the old-fashioned way as a protection against saliva and the moisture of the breath, where grinding surfaces are to be filled, or where the cavity is not near the margin of the gum. This method is applicable, of course, more particularly to the upper teeth.

Dr. John B. Rich. In applying the rubber dam to teeth which present great inequalities of circumference, especially where they

have been cut away with a file, it will sometimes be found that a single thickness of rubber will not perfectly adapt itself to the tooth, and leakage will occur. By slipping over the tooth some very small rubber bands, the surface is made smooth enough for the rubber dam to grasp it firmly and touch at all points. With regard to punches for the rubber dam, I have for a long time used a blunt, polished steel instrument, with a square end, about a quarter of an inch across, and, stretching the rubber over that, I touch it with a sharp blade at differing distances from the point, according to the size of hole desired.

Dr. Brockway. With all respect to Dr. Rich, I must say that I wanted to condemn that idea in my paper. What do we want of such an instrument when we have something that is simplicity itself? If only one hole is to be made in the dam, then this method that Dr. Rich has spoken of is a way of doing it, though not as good a way as by means of a hollow punch; but if a number of holes are to be made, I consider Dr. Rich's method almost impracticable.

Dr. Rich. I have often noticed that the methods presented by experts seem very foolish to those who are not expert. This making holes in the rubber dam is a case exactly in point. I know of no way in which a number of holes can be made with greater facility than by the method I have described. It is very simple, and can be used quickly and accurately.

Dr. G. S. Allan. Sometimes, while operating, the rubber dam is accidentally perforated, and in such cases I stop up the hole with a little cotton and sandarac varnish. Such accidents can be remedied in that way quickly and satisfactorily.

Dr. Rich. I have originated a little device to meet such cases,—a disk about half an inch in diameter with a groove in the edge. It is shaped like an eyelet, though the groove is not so deep. The rubber is held in the groove and the hole effectually stopped.

Dr. Dwinelle. When holes are made in the rubber dam accidentally, they can be stopped by another device which I have resorted to. Take a small cork, about twice the diameter of an ordinary lead pencil, and cut a groove around it near the end, and then with a sharp knife cut off the little section which has been grooved. Insert that in the hole, and the rubber will adapt itself to it with great facility, and the damage be effectually repaired. A half dozen of these little corks of different sizes can be kept on hand, and when an accident occurs one of them can be selected of the proper size and the leakage stopped.

President Jarvie. Gentlemen, we are always glad to have any of our Philadelphia friends with us, and none of them are more wel-

come here than Professor Peirce. He is with us to-night, and has come to read to us a paper upon function and its influence on organization.

Dr. C. N. Peirce. Mr. President and Gentlemen: It seems almost a sacrilege for me to break in upon a discussion of practical matters for the purpose of introducing one that will appear quite an innovation at a dental meeting.

[Dr. Peirce then read his paper entitled "Function: Its Evolution, and Influence on Organization." See the DENTAL COSMOS for January, 1886, page 1.]

President Jarvie. Gentlemen, this subject is open for discussion, and we shall be very glad to hear something upon it from some of the gentlemen present. Dr. Dwinelle, shall we hear from you?

Dr. Dwinelle. I think, Mr. President, that I will defer to Dr. Atkinson, who I hope will introduce the opening wedge to this discussion. We certainly shall not be able to discuss it as we would like to do this evening, and I suppose it will be continued at another time. It is a subject of very great interest to our profession.

Dr. Atkinson. We are, as Dr. Clark says, progressing. I at one time tried to understand the stringing of pearls before inquiring what sort of string was used or what kind of pearl it was, and found it unprofitable. In almost all our investigations the great difficulty is that we do not discriminate first principles sufficiently to recognize the classifications that we make, so as to give a progressive and coherent movement, and so be able to attribute it to any antecedent that to-night is called cause. I have yet to see a gentleman who knows anything about cause, in the sense of being the immediate power that elaborates any form of machinery through which function is manifested. I think that we are in the atmosphere of Marsh, of Leidy, and of Cope, in this paper; and we are not sufficiently versed in our investigations to profitably discuss this question. I agree with the paper in the main, but I think there is a misapprehension shown in the establishing of a sort of figment that is quite as wild as any of the former theories that were set up. It is a ghostly business, only called by different names. He says function. What is function? It is spoken of as if it were an entity, as if it were a producing agent, the creative will that said, "Let it be, and it was!" I have a way by which I try to get an understanding of this, and of all organization; but when I have to speak of an efficient cause I do not know anything about it. I simply know that there is antecedent and sequent. How do they know that the gull had only the common straight gut in it, with simply a swelling that

afterwards became converted into a gizzard? That is a kind of reasoning and conclusion that passes for science. It will not stand examination. As for the instance of the Indian suckling, suppose his babe had sucked his toe, would he have sucked a mammary gland into that?

The paper is a materialistic domination of a materialistic teacher, who has denied everything beyond what can be proved to the senses, wholly ignoring the consciousness; acknowledging the perception of the process, and denying this work of consciousness. That is the materialistic stronghold. He has given us a real hard-hearted kind of hypothesis; and all the really acknowledged scientific men expect to have something out of nothing, even if that something is nothing. It is this first postulate that we have to settle before we can discuss this subject understandingly, or get at anything like what we call cause. I can understand the presence of something that we call first postulates. We call these atoms; but we must say that they were either endowed with the capabilities of something besides these, that were awakened and arranged, or else that they have a potency to be awakened. When we remember that this metamorphosis that we call heredity directs all the rest of the supposed and looked-for conclusions, we will see that the endowment is there. Similarity to parents is there. We are very apt to ask about the origin of things. I have not been able to find the origin of any form of microscopic body until after the morphological activity had enabled it to cast a shadow, which impinges upon the retina, and that we call a granule. Then, when we come to take a great many of these entities and assume that the same thing occurs in the mass that occurs in the molecule, we are very badly tangled. Probably the doctor is the most erudite man in our body on that subject; but I do not give him credit for being original. I hear Leidy, Cope, and Marsh all through the paper. We could not see whether he had measured the processes through which his own mind went to formulate the postulates he gives us. But I am happy to-night to think that the Odontological Society has arrived at the humility of listening quietly to such a presentation; yet, with such an utter want of a thread on which to string the beautiful pearls we have seen, we will never get on.

The dentists are the men to whom we must look for advancement in this direction. There is not a medical society nor a church association anywhere that will stand the kind of paper that we will stand and not go to sleep. I was not very wide awake myself, and I would not have said a word if I had not been called on. I do not want you to interpret my feelings as being opposed to this kind of investigation, but I am opposed to having given us such a dose that

we cannot exercise enough digestory function to place it in such a condition as to be useful to us.

Dr. Howe. Mr. President, I feel like thanking Prof. Peirce very much for presenting to us the result of his thought on this subject, for his paper gives evidence of a great deal of thought and study, and on the spur of the moment it is a difficult matter for one not prepared to make any intelligent remarks about it. There was a point or two in the paper, however, that struck me as being especially worthy of attention, and to which I would like to refer. One of the points of the paper seems to be that the evidences of evolution by reason of function constitute an argument against design. I think that is a jump at conclusions, and an evidence of mental myope. It seems to me that, if evolution is proven, it does not necessarily do away with our belief in design, but that evolution may be true and yet design be true, as most of us believe it to be. Design may be back of evolution entirely; the design may be that environment and the necessities of condition will result in the survival of those organs and the development of those tissues, and of those species if you like, that are found to be so modified, developed, or evolved. I do not think myself that there is any necessity for coming to the conclusion that these evidences that are brought forward to show the evolution of organs, or of species either, need necessarily do away with the idea of design. The doctor himself suggested this point when he raised the question as to how far this differentiation may go.

A recent writer in one of our periodicals has said that nature is God and God is infinite. Now, for myself, I want a God who does not make mistakes, and, from what we know of nature, she is very far from that. What we call "nature" is only the observed law or rule according to which the phenomena about us and in us take place. The setting of evolution over against design is a short-sighted, contracted view of the whole subject. In other respects I think the presentation of such an array of instances in which function has produced such remarkable results is useful, and I thank the doctor very much for calling our attention to the great influence that the exercise of the parts or organs may have in their development, as well as to the fact that lack of function may have a retrograde effect upon them.

Dr. Atkinson. One word in regard to design. The design of the changing of that pouch of the gull's stomach into a gizzard was to adapt it to the grinding of the corn which then constituted its food. That would indicate that there was something behind that which might just as well be called design as function. The purpose of that change was to adapt the digestive organ to the grinding of that

kind of material that was placed in the digestory apparatus, so that the creature might be nourished. It had been in the habit of eating fish, that in turn were nourished upon their own kind, and did not require as complicated a digestory apparatus as would be required for grain. To accept it as a correct statement that there were gizzards found formed in creatures whose habits were changed would certainly be a very strong argument, in my judgment, in favor of design.

Dr. Dodge. Mr. President, I think it may be legitimate to point out a use of this principal paper of the evening which was not intended by the essayist. I desire to express my thanks to that gentleman for the laborious skill with which he has presented his argument and marshaled his evidences. A man likes to see a piece of work well done, whatever it may be, and nobody can deny that this was a carefully meditated and skillfully executed argument. It was evident throughout the paper that the animus of the whole writing was to build an escape from something. The paper offers a substitute for something. It is not original with this paper to offer such a substitute, and the line of argument by which it is sustained did not begin with the gentleman to whom we have gladly listened to-night. But I never saw this thing get into a meeting of dentists before, and for that reason I wanted to say my say about it. When you drop all the modern phraseology, and come down to the plain purport of this paper, it is this,—that science discovers in the development of organized bodies the result of a power that is within those bodies, and that this discovery is a substitute for the old notion that gizzards, or whatever else may belong to organized beings, are planned by an Infinite Intelligence, and, in the last analysis, caused to exist by an Infinite Creative Power. The substitute is called function here. It is called by other names in cognate writings. It is a substitution of something that inheres in the organism for the action of God Almighty; and I thank the gentleman who has presented the paper for the care and skill with which he has worked up his case, because the poor result under such management only emphasizes the intrinsic weakness of the argument. I would like to have the gentlemen who have been present here, as they think over the proceedings of this evening, just ask themselves whether this paper presents any clearer or simpler conception to the human mind of how the parts of organized bodies come to be adequate to their functions, than that old conception of an Infinite Intelligence superintending the development of all organisms; whether there is light substituted for darkness; whether it has given us plainness instead of mystery; and especially whether to the human mind that is accustomed to looking at things and inferring from what it sees if

not their causes yet their antecedents,—whether it furnishes to such a mind a more satisfying explanation of how the two eyes came to be on the same side of a flat fish. for instance, or how granivorous birds came to have gizzards, than to say that the Infinite Intelligence which made the world so planned it that through the process of development these things should result. I have read a good many of these arguments. I do not think I ever read one more carefully and ably elaborated than the one that has been presented to us this evening, and I shall go away pleased and gratified to find that, in its latest presentment and from so able a source, the argument is so intrinsically poor and weak that it amounts to nothing better than this.

Dr. Peirce. I would like, first, to give a little description of the origin of this paper. It has been my habit to try to discover some method of protecting the teeth of my patients from disintegration, and I have found that in many young patients mastication was neglected; that children were in the habit of drinking at meals and washing their food into the stomach without mastication, and that the teeth of such children invariably decayed more rapidly than teeth that received the stimulus of use. I have said to a number of mothers in my practice, "This child has by his plate at table a vessel of fluid, with which the food is washed into the stomach; and ten or fifteen minutes are spent at the meal, when twenty-five or thirty minutes should be." I have asked them to deprive their children of drink at meals, and teach them to masticate their food; and in six months I have seen a marked improvement in the condition of the teeth of those patients. I believe that this improvement is due to the stimulus of mastication, or the use which I call function. In my studies of comparative anatomy I have recognized in every animal a peculiarity of tooth-structure corresponding with the diet of the animal; and I have found that when an animal had changed its habit of diet, when it was placed in other conditions which necessitated a different food, that there was, even within one lifetime, a slight modification which, if continued through successive generations, would produce a very decided change in the tooth-formation and the condition of those organs. When I expressed that view at Worcester, Mass., this summer, and again before the New Jersey State Dental Society, there were some criticisms regarding the matter, which were kindly expressed. I then thought more of it than I had before, feeling that the teeth were greatly influenced in their structure and preservation by use, and that use I call function. I do not claim to be erudite in this matter. It has only happened that my mind has dwelt largely on the conditions that influence tooth-development, and those conditions I have tried to put into some

form for your consideration. To the gentleman who last had the floor I wish to say that, although he saw in the paper a desire to bring forward some force in the place of the old idea of creation, it was not my intention to be so interpreted. The theory of evolution may be called a materialistic theory, but it does not at all abrogate the intelligence that is believed to control matter. It was just as much design for the All-wise Father to arrange that these forms should be brought about through a course of evolution, and modified by use and adapted to their environments, as that it should be done in any other way; and when I use the term "design" I mean simply in the sense that I do not think it was designed to produce the organ for the food,—that the organ was not produced for the food, but by use. Dr. Atkinson asks how we know that the gulls have gizzards. A great many have been examined, and that condition of the alimentary canal has been found. I have said in the paper that rudimentary gizzards were developed into complete organs by the change of diet. In giving these illustrations I only wanted to bring out more fully and impressively the fact that function does modify tooth-structure, and that we cannot preserve the teeth of our patients, with all our efforts, unless those patients are careful to use them, and that use was the great stimulus to health. The paper, I acknowledge, was a little out of place in a dental society, but the estimate of it has been a little different from what was intended. I thank you very kindly for the attention given it in the reading.

President Jarvie. The hour is late, and we must adjourn. I wish to say that this has been a most interesting meeting, and I think we are indebted to the gentlemen who have taken part in it for that interest. We are especially indebted to Prof. Peirce for his very able and learned paper. I think he is mistaken in thinking there was an impression that the paper was out of place here. I think this is just the place for such a paper; and the Odontological Society tenders its thanks to him for it.

Adjourned. S. E. DAVENPORT, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

The annual meeting was held Tuesday evening, December 8, 1885, and the following officers were elected for the year 1886:

President.—E. A. Bogue, M.D., D.D.S.

Vice-President.—J. Morgan Howe, M.D., M.D.S.

Recording Secretary.—E. H. Raymond, D.D.S.

Corresponding Secretary—S. E. Davenport, D.D.S., M.D.S.

Curator.—W. A. Bronson, M.D.

Treasurer.—Charles Miller, M.D.S.

The "Council" (consisting of the elected officers) organized the

following Friday evening, and made choice of S. E. Davenport for "Editor" for 1886.

The executive committee is not yet chosen.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Tuesday evening, November 3, 1885, in the rooms of The S. S. White Dental Manufacturing Company, corner of Broadway and Thirty-second street.

The president, Dr. William Carr, in the chair.

Dr. C. F. W. Bödecker, chairman of the Clinic Committee, reported as follows: We have had to-day an unusually interesting clinic. The attendance was about eighty-five. Dr. Genese, of Baltimore, presented a dental obtundent, which is also for capping pulps. I tried it on two teeth; one was a lower first bicuspid presenting some erosion near the gum. Teeth in this condition, especially when the surfaces of the cavity appear as if polished, are not readily relieved of sensitiveness by any obtundent, but in this case the obtundent was apparently successful, and in the upper cuspid upon which I tried it the success was even more marked. Dr. H. A. Parr presented a patient for whom he had inserted a piece of bridge-work, to which were attached five teeth, viz., a lateral incisor, a cuspid, two bicuspids, and a molar. The attachment was made to the roots of the first molar and the cuspid. The peculiarity of this piece of bridge-work was in the method of its attachment to the cuspid root. A cap and ring, perforated in the middle, having been fitted and cemented to the root, a hole was drilled into the root for the reception of a strong pin, and the bridge-piece then accurately fitted over the cap. The same method can be followed in making attachment to molars, but in this case it was attached to the molar roots in the usual manner. Dr. J. Speyer exhibited his new surface cohesion forms, which are made of pure tin. In making a rubber case the model is first coated with rubber cement, and a form cut to size and shape pressed upon it, over which is painted another coating of rubber cement, and upon this a sufficient quantity of rubber is placed and pressed into position with the fingers. The teeth are then arranged and fastened in the rubber by heating. The plate is modeled altogether in this way without first modeling in wax. Incase the model with rubber and teeth in plaster, having placed in the water previous to mixing about half a teaspoonful of alum and sulphate of potash. The case is then vulcanized and finished in the usual manner.

Incidents of Office Practice.

Dr. W. H. Atkinson. I have something to report in the direction of incidents of office practice that is fresh in itself, but only a repetition of the experience of a good many years:

A girl of some eight years had her inferior central incisors dislocated by a stone. Her parents put her under the charge of a beloved and trusted M. D., who poulticed the chin until suppuration made its way through the under jaw at the junction of the variable and permanent portions immediately at the mental symphysis. She continued in charge of her doctor for seven years, at the expiration of which time the mother, seeing her beloved child budding into womanhood with a running sore at the chin, asked in all confidence of the doctor, "How long is this to last?" To which he replied he would think it over and inform her. In some three weeks he gave her a letter to a renowned professor of surgery in one of the oldest and best-known medical colleges in this country. She took the child to this professor a few days since, and got for reply that he would confer with her doctor. And the result was advice to take the child (now a young lady) to her dentist, and have him extract the inferior central incisors (both being pulpless), and in three weeks after the teeth were out to bring her to him for the operation. The mother obeyed and took the daughter to her dentist, informing him of her wish to follow the advice of high authority. Upon examination the dentist told them he could not consent to extract the teeth without the advice and consent of a dentist whom he named; whereupon she wished to know if the doctor was not sufficient authority for him to depend upon. Suffice it to say that the dentist gave the mother a note of introduction which she brought to me on last Saturday afternoon. After detailing the foregoing history, she desired me to give her my advice, which was to bring her daughter and the dentist, and we would decide how to proceed; and if the doctor would come to bring him also.

On November 1 the father came with the daughter. The dentist came also, and we proceeded to open through the length of both inferior central incisors fully into a pit in the jaw bordered by necrosed cancellous and dense bone, and connecting with the fistula under the chin. With a fine dressing-needle wrapped with cotton we pumped creasote and oil of cloves till it oozed from the fistula. Then we packed the opening with a pledget of cotton wet in creasote and oil of cloves, to distend it so as to afford ready access to the necrosis for the burr with which to remove it on the third day following; the dentist to renew the tents in the meantime, to open well down to the dead bone. She came, and the carious bone was burred out, and a dressing of wine of opium on a pledget of cotton was made

to keep it open till the next day, when, after starting fresh blood, a sponge-graft was inserted, and she was again dismissed.

November 11. A portion of sponge protruding was clipped off, from which a little serum escaped.

November 14. Clipped again, and dressed with a weak solution of bichloride of mercury.

November 19 and 25. Repeated treatment, adding a little elixir of vitrol.

November 29. Repeated bichloride and syringed with peroxide of hydrogen, to prove quality of serum, granulation not coming forward as fast as desired, but no pus was indicated. To improve the blood crasis, we now gave cinchonidia and nux vomica, phosphorus and cantharides pills.

I saw her again on December 2 and 6, and repeated the dressing. I expect to get such a reproduction of tissue as to leave no track but a beautiful dimple.

Dr. Frank Abbott exhibited and explained the working of his spray apparatus for treating diseases of the antrum and for throwing a current of hot air into cavities, described in Transactions of the American Dental Association, and gave some formulæ of the medicines used in spraying the antrum, as follows:

℞.—Morph. sulph., gr. iv;
Acid. carbolic., f ʒ ss;
Acid. tannic., ʒ ss;
Glycerin pur.,
Aquæ dest., āā f ℥ ss.
M.
Sedative, antiseptic, astringent.

℞.—Acid. carbolic., f ʒ ss;
Acid. tannic., ʒ ss;
Tinct. iodi., f ʒ ss;
Glycerin pur.,
Aquæ dest., āā f ℥ ss.
M.
Antiseptic, astringent, stimulant.

℞.—Acid. carbolic., f ʒ ss;
Acid. tannic., ʒ ss;
Glycerin pur.,
Aquæ dest., āā f ℥ ss.
M.
Antiseptic, astringent.

℞.—Acid. carbolic., f ʒ i;
Glycerin pur., ℥ i;
Aquæ dest., f ℥ vii.
M.
Antiseptic.

℞.—Acid. tannic., ʒ ss;
Glycerin pur.,
Aquæ dest., āā f ℥ ss.
M.
Astringent.

℞.—"Listerine," f ℥ i;
Aquæ dest., f ℥ iii.
M.
Antiseptic.

℞.—Spt. menth. pip.,
Spt. camphoræ, āā f ʒ ss;
Aquæ dest., f ℥ i.
M.
Stimulant and slight sedative.

℞.—Ammonii chlorid., ʒ i;
Aquæ dest., f ℥ viii.
M.
Stimulant.

℞.—Potass. chlorat., ʒ i;
Aquæ dest., f ℥ iv.
M.
Stimulant.

Dr. S. G. Perry. I think I can confirm a statement of Dr. Abbott's regarding Dr. Bing's early use of compressed air. I saw in his cellar in Paris, four years ago, I think, a large iron cylinder, something like an ordinary steam-boiler cylinder, which was arranged for the compression of air. Attached to that cylinder was a flexible tube that connected with a spiral platinum tube, very much as Prof. Abbott has it arranged, and his habit was to hold it over the flame of a lamp until it was sufficiently heated to warm the air which he used upon the teeth. He was extravagant in his claims as to the effect he was able to produce upon the dentine. May I ask whether Prof. Abbott has had opportunity to test the efficacy of warm air as an obtunder in excavating?

Dr. Abbott. I have not. I know that those who are using it in that way are very extravagant in their remarks about its good effect.

[At this point Dr. J. N. Farrar delivered an address on "Mechanical Appliances for Regulating Teeth," but on account of its length we are compelled to defer its publication to another issue.—Ed. Dental Cosmos.]

President Carr. We have with us to-night Dr. Genese, of Baltimore, and we would be pleased to hear from him.

Dr. Genese. Mr. President and Gentlemen: The hour is so late that I will ask your attention but a short time. In the city from which I come the consideration of expense in dental work cannot be ignored. In our dental colleges and societies we have to treat the poor people who come to us in the best way possible with the least cost, and so we save them the expense of metal in regulating appliances, and try to gain such results as Dr. Farrar has just been explaining. I have here a number of appliances, and I think that of all of them there are but two with any metal attached to them, and that metal is steel. In using steel in the mouth it is necessary to protect it from the fluids, and a coating of pure tin will serve that purpose. It is, however, a little troublesome to do this and retain the temper, but it may be accomplished by first making the steel quite hard, scraping it as bright as possible, steeping it in muriate of zinc, and then putting it in a bath of pure melted tin. When taken out it is coated with tin and has almost a spring temper. Most of the plates I have here covered considerable surface in the mouth, and movement of the teeth was accomplished with the old-fashioned wooden pegs, and in some cases in connection with steel springs. I think the models I pass around will explain the method to you. In using wooden pegs it is not best to move all the pegs at

one time. Move each one separately,—one to-day and another to-morrow; you then have a guide as to how far the teeth have moved. I have used metal bands on but one appliance, and I found every one of them moving, which caused me to abandon them entirely. If there is any friction from metal bands, and the enamel is softened, it will be cut through in a short time. In conclusion, I have but two more models to show you. One is the model of the mouth of a tobacco-chewer, showing a curious combination of pyorrhea, hypertrophy, and atrophy in one mouth, with a complete attrition of all the upper teeth down to the pulp-cavities; and the other model is, I think, the cap-stone of all. It is a case of lupus combined with syphilis, in which the entire face has been eaten away. I was called upon to make an apparatus for the man; I succeeded, and the poor fellow wore it for two weeks, but the irritation was so great that sloughing commenced, and he had to leave it off. For thirteen years he has been in the condition which that model portrays, and he has not long to live.

Dr. M. Rynear. There is a method of moving teeth that I have used for a number of years and found very serviceable. It is something on the same general principle as that described by Dr. Genese, but it is different in its details. I make a plate similar to that which Dr. Genese has shown you, the rubber passing over the grinding surface of the molars, and on reaching the cuspids passing down against the palatine surfaces of the incisors and approaching near their cutting edges. After ligating the plate to the cuspids by means of floss silk passing through holes made in the plate, I take a piece of Northern pine, or any other soft wood, and, after compressing it in a vise, insert it between the plate and the palatine surfaces of the incisors that are to be moved outward. Have the grain of the wood so placed that when it swells from absorbing the fluids of the mouth the expansion will be in the direction of the teeth and the plate, and not laterally. This expansion of the wood forces the teeth outward. Where it is desired to move teeth that stand outside of the arch back into their proper position, a portion of the plate opposite the palatal surfaces of the teeth to be moved is cut out to the extent that it is desired to move the teeth inward. Two small holes are now made through the posterior portion of the plate at the points toward which the teeth are to be drawn, and, before the plate is inserted, floss silk is passed through these holes, to which is attached a small piece of rubber tubing. This rubber tubing is then ligated to the teeth, so that it will be sufficiently tight to produce the desired traction. It will be understood that this plate can be used to effect both processes; that is, to force the teeth outward as well as inward. I first used this method in my practice as far

back as 1865, and I believe I can justly claim priority in it. I prefer it to that which Dr. Genese has just described to you.

Dr. Bödecker. I desire to thank both Dr. Farrar and Dr. Genese for their interesting remarks this evening, and while I shall not attempt to discuss them, I would like to mention that while in Bremen I saw an apparatus which Dr. Herbst had used very successfully. It was a plate somewhat similar to that described by Dr. Rynear, but instead of using wood for wedging he used dry cotton, packing it tightly between the plate and the teeth to be moved. I saw several patients of Dr. Herbst's for whom front teeth had been moved by this means, and I believe it is a very good and successful method. Adjourned.

B. C. Nash, D.D.S., *Secretary.*

MASSACHUSETTS DENTAL SOCIETY.

At the twenty-first annual meeting of the Massachusetts Dental Society, held in Boston, December 10 and 11, 1885, the following were elected officers for the ensuing year:

S. G. Stevens, president; E. B. Hitchcock, first vice-president; Horatio C. Meriam, second vice-president; W. E. Page, secretary; Edward Page, treasurer; R. R. Andrews, librarian. G. F. Eames, E. C. Leach, J. G. W. Werner, F. A. Cooke, J. K. Knight, and R. R. Andrews, executive committee.

E. O. Kinsman, *Secretary pro tem.*,
Cambridge, Mass.

ST. LOUIS DENTAL SOCIETY.

At the annual meeting of the St. Louis Dental Society, held January 5, 1886, the following officers were elected for the ensuing year: Wm. N. Conrad, president; Geo. A. Bowman, vice-president; Albert H. Fuller, corresponding secretary; J. L. Foster, recording secretary; and Henry H. Keith, treasurer.

Albert H. Fuller, *Cor. Secretary,*
2626 Washington avenue, St. Louis, Mo.

SOUTHERN DENTAL ASSOCIATION—CHANGE OF DATE.

The date of the next meeting of the Southern Dental Association has been changed from the fourth Tuesday in May to the last Tuesday (27th) in July, 1886, at Nashville, Tenn. This change has been made at the request of prominent members of the association in Texas, South Carolina, North Carolina, Georgia, and Alabama, whose State societies meet about the time originally set for the

Nashville meeting, and with the concurrence of a large number of the members in the other States.

W. C. Wardlaw, *President*, Augusta, Ga.

VERMONT STATE DENTAL SOCIETY.

The tenth annual meeting of the Vermont State Dental Society will be held at Bellows Falls, Vt., commencing the third Wednesday in March, 1886, holding sessions for three days.

Thos. Mound, *Secretary*,
Rutland, Vt.

UNIVERSITY OF CALIFORNIA—COLLEGE OF DENTISTRY.

The fourth annual commencement exercises of the College of Dentistry of the University of California were held, in connection with those of the Medical Department, at the Grand Opera House, San Francisco, on Tuesday, November 10, 1885, at 2 o'clock P.M.

The address on behalf of the Dental Department was delivered by Professor Maurice J. Sullivan, D.D.S.

The number of matriculates for the session was thirty-seven.

The degree of Doctor of Dental Surgery was conferred upon the following graduates:

Harry Sylvester Bettis,
George Botsford,
Daniel Barratt Cate,
Nathaniel Thomas Coulson,
George Ihnier Drucker,
William Ellis Fitzpatrick,
Walter Robert Henderson,
John Adams Douglass Hutton,
Franklin Pancoast,
Charles Theodore Rodolph,
Frederick Judson Saxe, A.M.,
Joseph Schneider,
Henry Sylvester, Jr.

OBITUARY.

S. C. BARNUM, D.D.S.

Died, at his residence in New York City, December 24, 1885, Dr. S. C. Barnum, in the forty-seventh year of his age.

Dr. Barnum was born at Oakland Valley, Sullivan county, New York. He entered the office of Dr. J. W. Clowes, of New York, as a student of dentistry in 1858, and four years later commenced practice in Monticello, N. Y. He graduated at the New York College of Dental Surgery in 1868. It was during his residence in Monticello that he conceived the idea of the use of the rubber dam in dental practice, and in June, 1864, Dr. J. W. Clowes, at Dr. Barnum's request, presented to the dental profession the knowledge of the rub-

ber dam as a free gift. How this simple device has revolutionized the practice of dentistry need not be told.

Dr. Barnum was of a retiring disposition, but thoroughly earnest and straightforward in all the relations of life.

DR. M. L. LOGAN.

Died, at Tyrone, Pa., March 9, 1885, of consumption, Dr. M. L. Logan, in the forty second year of his age.

Dr. Logan was born near Saulsburgh, Huntingdon county, Pa., August 21, 1844. He was an active and honored member of the Central Pennsylvania Dental Association, and of the Pennsylvania State Dental Society. He was a respected and beloved member of the M. E. Church. He leaves a widow and three children.

At a meeting of the Central Pennsylvania Dental Association, held at Huntingdon, January 1, 1886, resolutions were adopted expressive of the high esteem in which Dr. Logan was held both as a man and a dentist.

DR. S. G. MARTIN.

Died, at Syracuse, N. Y., December 9, 1885, of Bright's disease, Dr. S. G. Martin, in the fifty-sixth year of his age.

Dr. Martin was born in the town of MacDonough, Chenango county, N. Y., April 11, 1830. He entered upon the practice of dentistry in Meadville, Pa., and in 1860 went to Syracuse, where he practiced for twenty years, when ill health compelled him to abandon the profession. He was at one time a member of the Fifth District Dental Society of the State of New York, and was the first president of that organization.

DR. JAMES SHEPHERD.

At a meeting of the Massachusetts Dental Society, held in Boston, December 11, 1885, resolutions were adopted with reference to the death of Dr. James Shepherd, of Boston, expressive of personal and professional esteem, and testifying to his genial and kindly character.

DR. R. L. ROBBINS.

Died, in Cambridge, Mass., December 29, 1885, of heart disease, Dr. Robert L. Robbins, in the sixty-sixth year of his age.

Dr. Robbins was born in Cambridge, and resided there at the time of his death, which occurred suddenly while on the way to take the train for Boston, where he had practiced dentistry during most of his professional life.

PERISCOPE.

Osteoma.—The next specimen, to which I will now refer, is the osteoma developed from the cementum or crusta petrosa of a cuspid tooth. I am very sorry that I cannot give you anything of the clinical history, because I believe it would be interesting if known. In consequence of this, it is perhaps necessary that I should give a word of explanation as to how it came into my hands: A friend was speaking to me of some one who had been subjected to the operation of drilling through the fangs of six teeth on account of what was called "ossification of the nerve." In speaking to one of my acquaintances among the dentists about such a condition, I was presented with a tooth a section of which I exhibit to you. You will see, both macroscopically as well as microscopically, that the line of demarkation is well defined. You will further see that the general appearance of the tumor is that of bone, and that it differs greatly from the general appearance of the tooth proper. It is interesting to observe moreover that the canal, through which the nerve and vessel enter, is greatly diminished in its course through the tumor; consequently great pressure must have been exerted on the nerve. Before making the section, I had supposed that the canal was completely obliterated, so small is its opening at the end of the tumor. On looking at the specimen through the microscope, you will see very clearly that, while the line of demarkation between the dentine and the proliferation of the crusta petrosa is well marked, and the lacunæ and canaliculi of the bony structure of the tumor are well demonstrated, there are also a number of contorted tubules in the bony tumor which resemble, somewhat, the dental tubules. Haversian canals are of course not present; they never are in such growths.

Although I have no clinical history to present, I may add that the usual clinical history is one of severe pain, which nothing but extraction seems capable of relieving.—*Dr. Robert Tilley, Trans. Chicago Med. Soc., in Peoria Med. Monthly.*

The Relation between Inflammation of the Gums and Disease Elsewhere.—The origin of the various skin eruptions, vomiting, convulsions, diarrhea, and constipation, so frequently found to be coincident with the process of dentition in children, is, in the opinion of Kaczorowski, to be sought less in the condition of the teeth than in that of the gums. The author, impressed with the idea that the essence of most inflammatory processes consists in an infection by micro-parasites, proceeded to treat the swollen gums and cavity of the mouth with a solution of tincture of iodine in common salt (chloride of sodium, 1 per cent.; tr. iod., 0.5 per cent.). A half to a teaspoonful of this solution, according to the age of the child, is applied every quarter or half hour. He found that, simultaneously with the paling of the gums, the concomitant catarrh of the respiratory and digestive mucous membranes, the feverishness, and the reflex nervous phenomena came to an end, without the use of other means than a simple purgative. Further observations of this connection between diseases of the gums and other affections led

the author to apply the same treatment to adults. That the cavity of the mouth, which is the great entrance gate through which organisms find their way into the body, should be first attacked by them is not surprising; swollen gums form a suitable nidus for their development. A receptive state of the mouth is produced in children by the mechanical injury done to the gums by hard teething-rings, and in adults by artificial teeth, plates, and the like, and by chemical substances. But the greatest share in the process is played by the teeth. They irritate mechanically when they are decayed, chemically when they are foul, and functionally during their eruption.—*Manchester Medical Chronicle.*

Lagophthalmus Due to Dental Irritation.—At the November meeting of the Odontological Society of Great Britain, Mr. S. J. Hutchinson related the following interesting case of reflex nervous disturbance caused by dental irritation: The patient, a lady, was sent to him by Dr. Gowers, in October, 1883, with a request that he would examine her teeth, and see if he could discover any probable cause for a spasm of the left eyelid, from which she had suffered for several months. The eyelid was drawn up by a constant spasmodic contraction of the levator palpebræ in such a manner that not only the whole of the iris, but also a considerable amount of the white around it, was always visible. Mr. Hutchinson found the patient's teeth in a bad state. The left second and third molars, both upper and lower, were much decayed, and Mr. Hutchinson extracted all four; but, though the patient no longer suffered from neuralgia, as she had before, the spasm of the eyelid was not in the least diminished. There did not appear to be anything amiss with the other teeth on that side, except that the upper first molar contained a large amalgam stopping; but, as the tooth had never given her any pain, the patient would not consent to its being interfered with. She then returned to her home in the country, and Mr. Hutchinson saw nothing of her for more than a year. When she again presented herself the eye was in the same condition, and Mr. Hutchinson again failed to find anything in the mouth likely to be a source of irritation except the amalgam stopping in the left upper first molar. After some persuasion the patient allowed Mr. Hutchinson to remove this, and he then found a minute exposure of the pulp on which the filling had evidently pressed. Mr. Hutchinson advised the removal of the tooth, and the result was most satisfactory. The patient's appearance at once began to improve, and at the end of six months the difference between the two eyes was so slight that it would not be noticed by a casual observer. It was evident, therefore, that in this case reflex irritation of the third nerve had been caused by irritation of a branch of the fifth, and this in the absence of any symptoms referable to the tooth.—*Med. and Surgical Reporter.*

The Relations of Development to Use.—Long before Darwin was born the axioms had become trite that practice perfects, that use brings strength, that effort leads to power, the "will" to the "can." But it has remained to the naturalists of the latter half of this century to assign their full meaning to these aphorisms of ancient date. In proportion as the scope of observation extends, we

learn how these laws govern and have always governed the development of organic nature. We have also learned to study the reverse of the pictures they offer, and to appreciate how lack of use leads to atrophy, to debility, and to destruction.

An interesting study, illustrating the power of these principles in reference to one branch of the animal economy, appeared in a recent number of the Dental Cosmos, from the pen of Dr. C. N. Peirce, of this city. Selecting the development of the teeth in the various genera of the animal kingdom as his theme, he demonstrates by a wide series of examples that their presence or absence, their form and prominence, their histology and their physiological character all bear distinct genetic relations to the character of use or to the lack of use to which these organs have been applied, in anterior times, by the particular species under consideration. The article is drawn from such an extended range of comparison that we shall not attempt to epitomize it, and refer those who would pursue its reasoning to the original.

What Dr. Peirce has here presented as an abstract of the natural history of the teeth could, with equal propriety, be carried out for all the organs of the body. Each will be found by the comparative anatomist and physiologist to owe all its peculiarities in different species to the kind and amount of use to which it has been subjected in this and previous generations. This simple fact is the key to all the mysteries of organic form and proportion.—*Medical and Surgical Reporter.*

Hypodermic Injections of Salicylate of Cocaïne in Neuralgia.—The *Lancet*, Oct. 17, says that Dr. Max Schneider has successfully employed subcutaneous injections of 0.4 gramme (about a quarter of a grain) of salicylate of cocaïne in the case of a woman suffering from a third attack of severe neuralgia affecting the second and third divisions of the fifth nerve. Her first attack, which occurred five years previously, had been cured by large doses of quinine. The second attack lasted for nearly six months, and was quite unaffected by quinine, but ultimately yielded to morphia and iron. The third attack had already lasted for four weeks, when the author commenced the use of the cocaïne. He injected it into the right cheek eight times in six days, the punctures giving no pain, and being followed by no unpleasant effect. This was followed up by the employment of the constant current, the anode being applied to the painful spots, which corresponded with the points of exit of the branches of the nerve, and the cathode to the neck. The relief from pain and from the consequent insomnia afforded by the cocaïne was remarkable, and Dr. Max Schneider thinks that this method of relieving neuralgia is well worth further trial.—*Medical and Surgical Reporter.*

Hemostatic Powder.—At a recent meeting of the Academy of Medicine in Paris, Professor Bonafoux read a paper upon a powder which possesses great hemostatic powers, and is capable, it is said, of arresting the bleeding of large arteries, so that it will prove serviceable in important surgical operations. This powder is composed of equal parts of colophony, carbon, and gum arabic. Experiments

have been made with it on the brachial artery in man and on the smaller vessels, on the carotid of the horse and other vessels of the same animal, with marked success. It has always prevented consecutive hemorrhage. The application can be lifted in the course of two days, when the vessels are found to be completely obliterated. —*London Letter in Jour. American Med. Association.*

HINTS AND QUERIES.

Fracture of Porcelain Gum Sections in Vulcanizing.—There are comparatively few dentists who have not at some time suffered annoyance and loss on account of the fracture of one or more porcelain gum sections during the process of mounting them on a vulcanite base. It is therefore deemed probable that an inquiry into the causes, or at least an attempt to ascertain some of the common occasions, of such disasters may prove to be of general interest to the dental profession. With this view a collocation of pertinent facts and opinions found in various numbers of the Dental Cosmos is here presented, together with some practical suggestions recently received. The articles referred to will not be reprinted, but the relevant gist of each of them will be given in abstract form.

A used to grind sections tight in front, and open to the rear, but he learned to first grind tight front and rear, and then bevel each block from the rear to within a twentieth of an inch of the front, forming a rearward V-shaped joint, in which he poured thin plaster before packing. No subsequent breakage.

B, after working with a certain make of teeth and rubber with uniform success for years, began to have trouble, which occurred after removal from the vulcanizer. He had become almost disheartened, when luck again came to him, and without consciously changing method or material the cases came out perfect,—exceptions very rarely occurring. At the time of his ill luck he was fretted by the fact that his neighbors, using the same teeth and rubber, never had any such trouble. He thinks fracture due to too nice a joint at the shoulder near the pins, and therefore cuts that away, and fills the space with plaster to allow the arch to contract on cooling. He also bevels the upper edge of the gum, and lets the rubber barely cover that edge, to avoid the pulling force of the contracting vulcanite.

C says that, if not broken when taken from the flask, a slight chatter of the rough file will cause fracture in finishing.

D learned from his wife not to put cold porcelain into hot water, and he now has no broken blocks because he is always careful to make changes in temperature gradual.

E discarded his worn, rusty flasks for well-fitting brass flasks, and he has since had no trouble.

F says that blocks break *after* vulcanizing because all rubber contracts in cooling, and the purer the rubber the more it contracts. He instances the covering of iron tubing, sixteen inches in diameter, with rubber half an inch thick. On cooling, the band burst with a report like a cannon, and opened three-eighths of an inch. The foreman had to resort to the use of a less pure rubber, a lower vulcanizing heat, and slow cooling. He thinks it no wonder, then, that such contractile force should fracture a porcelain block having a long, thin arm, and curved both in its length and breadth; especially when the rubber largely overlaps the the gum-edge. The method of jointing the sections has much to do with the fracture, as also a sudden change of temperature in first cooling after vulcanizing.

G had no trouble himself, but wishing to be useful to his brethren, inquired of five gentlemen whose whole time was devoted to making such plates for other dentists. They were all using teeth of several manufactures, and declared that whatever they might have to say of the relative ease of fitting the blocks, or their appearance when finished, the one fact was true of all of them, that they did not fracture in their hands. He thinks dentists having exceptionally bad luck should look carefully to their methods for explanation.

H never paid attention to the grinding of a perfect joint entirely through the sections, nor was he careful to form a V-shaped space. After investment he pours boiling water over the sections to remove the wax, and carefully seals the joints with oxychloride of zinc, allowing twenty minutes for it to harden. He then gates freely, packs carefully, avoiding a surplus, and puts the flask immediately in boiling water. He has used several grades of teeth, always the best rubber, and has not broken a block in five years. He never lets the rubber cover the edge of the gum further than a sixteenth of an inch. He considers the probable causes of fracture to be superfluous rubber, insufficient gates, too great pressure in closing the flasks before the rubber is softened by heat, and too much gum-border grasped by the rubber.

I, an Englishman, says dentists often pry the flask open in a hurry, or rap it hard with a hammer to loosen the plaster, and by concussion break the teeth (or gum) opposite the blow. Many prefer to lay the blame on the teeth rather than on themselves. Often after removal from the flask no cracks are seen, but while finishing the gums are found to be checked, which is done by holding the pliable and springy plate too tightly in the hand while filing. A quick rasp of the file will also break the thin gums.

A gentleman who has talked on this subject with a great many dentists concludes that, if the glass-like sides of the sections are in actual contact at any point, the contraction of the rubber must break one or both blocks, as a piece of glass is broken by pressure over the edge of a file. He therefore reports the successful dentists as found only among those who grind square joints so close as just not to touch. When that is accurately done, no rubber will come through from back to front, and contraction is thus perfectly compensated; premising, of course, that if any rubber is placed over the gum-edge, such edge has been suitably beveled and only slightly covered by a thin, narrow band of rubber. He also suggests that to over-vulcanize a case increases the amount of contraction and the liability to fracture of the blocks.

A dentist of great experience says that he invariably avoids fracture by packing *only* the palatal portion of the flasked cast with a single piece of two or three thicknesses of the sheet rubber, so cut and placed on *the cast* that when the two parts of the flask are at first screwed together there shall be no rubber on the ridge of the cast under the sections; but, as the flask is gradually closed, the softened rubber will *flow* under the sections without endangering them, and also without such pressure as to be driven through the joints.

From the foregoing it would seem that, eliminating from the data any reference to good or bad luck, the fracture of a section may be plausibly attributed to defective manipulation at some point in the process of mounting the blocks or finishing the denture. Fracture is probable if the sections *touch* in front, and *flare* from front to rear; if they *touch* from front to rear; if the gum-edge is not *beveled* from front to rear; if a thick rubber border covers the gum-edge; if *hot* water is poured on the flasked *cold porcelain;* if the *gates* are too few or too shallow; if there is a great *surplus* of rubber; if the rubber is not heated to

softness when the flask is closed; if after vulcanization the flask is too *quickly cooled;* if the flask is *roughly pried* open; if the flask is *rapped* too *hard;* if the plaster is *knocked* out of the plate; if the parting-ring and gates are roughly removed; if the plate is *grasped* too *hard* in the hand; if the file or rasp is so *roughly handled* as to make the plate chatter; if at every step there has not been an abiding consciousness of the central facts that thin porcelain cannot be safely squeezed, bent, shocked, knocked, or suddenly heated or cooled, and that vulcanized rubber invariably contracts with great force while cooling, and such force is invariably exerted on the porcelain sections in a direction favorable or unfavorable to their fracture, according as the sections have been properly or improperly adjusted relative to each other and to the lines of contractile force.

If, on the other hand, the gum-edges are properly beveled; the square-jointed, half-beveled sides brought as near together as possible without touching; the V-shaped spaces formed by the two half-bevels just filled with thin oxychloride and allowed twenty minutes to harden; numerous deep gates made; just enough rubber is carefully packed in; the flask heated long enough to soften the rubber before the flask is closed; the flask slowly cooled after vulcanization; the piece carefully removed from flask and plaster and gently handled in cleaning, cutting, and finishing, the probability of uniform success may be considered as assured.

In the preceding résumé no allusion has been made to exceptional cases,—as, for instance, when a section is flasked in contact with the cast so that on finally closing the flask there will be but a film of rubber at that point between the section and the cast. In this and in similar cases it is evident that the flask-guides must fit exactly, the gates be ample, and the thoroughly softened rubber be pressed gently and gradually out, or fracture must occur. As a permissible precaution in such cases, and also if the natural gum-ridge projects, the cast after flasking may be pared flat at the contact point, and when finishing the plate a fine engine-bur will suffice for the safe removal of the vulcanite covering that part of the section, the sharp angle of the flat with the curved portion of the plate serving to clearly define the border line of the part to be burred away.

Accidents only excepted, it may be fairly concluded that a fractured gum section is *prima facie* evidence of unskillfulness or negligence on the part of either the expert or the novice in mounting porcelain gum sections on vulcanite.

It goes without saying that the thinner the section the more liable it is to fracture; that the greater the curve either way, and especially if curved both ways, the greater the care required.

Nor should it be forgotten that mechanical judgment is essential in the selection of a set of teeth adapted to a given case. The thin, delicate gums of some sections are intended for use in exceptional cases only, as where single teeth would manifestly suit better than blocks. If sections are demanded by a fastidious patient, under such circumstances, the patient and the dentist should alike realize the extra risk of such adaptation.

If the above résumé should help some of his co-laborers, the writer will be amply rewarded for the effort to show some of the causes of failures and indicate methods of avoiding them.—W. H. S.

A Case of Replantation.—The report of a case of replantation in the Dental Cosmos for September reminded me of a similar case which came to my knowledge in my own practice some eight years ago.

The lady, aged thirty, fell upon the ice, and her jaws being somewhat prognathous, her upper front teeth struck the ice with great force, knocking out the superior left lateral incisor, and loosening the adjoining teeth. The patient was

carried into the house in an unconscious condition. The accident occurred late one afternoon. The next morning, after she had recovered consciousness, she greatly bewailed the loss of her tooth, and search being made, it was found, covered with ice and snow, having lain in this condition some eighteen or twenty hours. The tooth at this late hour was replaced by the lady herself, and without being ligated, and with no other than ordinary care for a few weeks, it became well and strong enough to be of the same use to her as her other incisors. There was some discoloration and slight elongation, but the tooth was perfectly comfortable and useful until a second accident occurred to it, a year afterward, at which time it was loosened by inadvertently biting on a bone while eating squirrel. After this it became somewhat inflamed and sore, and continued so for six months. It was so annoying at this time that the lady repaired to a brother practitioner and had it extracted. On examination the root showed some absorption at the apex. It had, however, done good service for one year, and fair service subsequently for six months more.—M. H. Fletcher.

An Obscure Case.—The following obscure case came before my notice a few weeks ago: Mr. C., solicitor, aged about fifty-five, suffered severe neuralgic pains about both eyes and temples, finally extending to the back of the head, when the attack subsided. He has consulted some of the acknowledged leading professional men in England and on the Continent, including a very clever oculist, but with no relief, and has long since given up all hopes of being cured. He had been persuaded to call on me through the recommendation of a friend of his whom I had treated. The first attack came on when he was about twenty, and ever since then he has had attacks at intervals of from a few weeks to months, and lasting from one or two days to as long as ten days. I thought they might have some connection with the wisdom-teeth, although he had never suffered from his teeth in any way, and did not know the meaning of toothache. Upon examining his teeth I found them all present except one upper second molar, which had been removed on account of its looseness. A few cavities were found, and the gums were receding from about the necks of the teeth. I thoroughly cleaned all his teeth, stopped all cavities, and applied astringents to the gums. This is all I have done as yet. I feel quite confident that the trouble is not connected with the teeth at all. If any of your readers can suggest any treatment that is likely to be successful, I shall be only too happy to make use of their suggestions.—M. Cottle, *Wanganui, N. Z.*

To the Editor of the Dental Cosmos:

As the following anomaly is of rare occurence, and being somewhat similar to the one recorded in the January number of the Dental Cosmos, I relate it: I have an inferior left cuspid in my possession which has two distinct roots. I extracted it four months ago for a woman about thirty-five years of age.—D. Taylor, *Jersey City, N. J.*

To the Editor of the Dental Cosmos:

A suggestion with reference to broken plaster teeth on models: When a plaster tooth has been broken off in separating or in some other way, replace it carefully on the model, and hold it firmly and securely in place; then take a long nerve drill, in size to correspond to a large pin or steel brad, and drill a straight hole down through the tooth into the body of the plaster; countersink the entrance, and drive in a closely-fitting pin or steel brad, and you will have a very neat and secure repair.—R. W. Morris, *Dayton, O.*

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

THE PIN AND PLATE BRIDGE.

BY WILBUR F. LITCH, M.D., D.D.S., PHILADELPHIA, PA.

In the DENTAL COSMOS for August, 1880, the writer described a method, more particularly applicable to incisors and cuspids, for the permanent attachment of artificial teeth to natural teeth in the mouth, which form of bridge-work may for convenience be designated the pin and plate bridge, as distinguished from the more generally applicable form, the crown and bar bridge. As a longer experience, while confirming the value of the method, has led to certain modifications of the original plan of construction, a description of the processes as at present conducted will be given in this paper, the text and illustrations of the original article being reproduced as far as they have been found available.

FIG. 1.

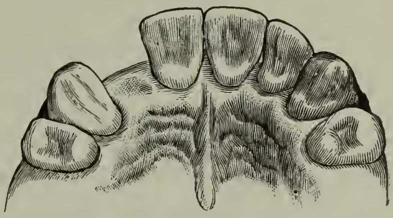


Fig. 1 represents a typical case, in which a lateral incisor (crown and root) has been lost, the cuspid and front incisor, fully vitalized, and without approximal carious cavities, remaining in position.

TO MAKE A PIN AND PLATE BRIDGE.

1. Take in plaster an accurate impression of the cuspid and incisor and the interspace. From this obtain a plaster model of the parts.

2. Make from pure gold, rolled to the thinness of 26, standard gauge, base-plates, to be carefully ajdusted to the palato-approximal surfaces of the cuspid and incisor. These can be made by swaging on dies and counter-dies obtained from the model, but more conveniently by bending the gold into shape upon the plaster

model and pressing and burnishing it into perfect adaptation upon the natural teeth.

3. Select a plain plate porcelain tooth of suitable length, shape, and shade, and wide enough to fit easily into the interspace. Let the neck of the tooth rest lightly upon the gum.

4. With pure gold or platinum make a backing for the porcelain tooth.

5. Place the tooth thus prepared and the base-plates already made upon the cast and accurately adjust the approximal edges of the base-plates to the backing of the porcelain tooth *in situ* upon the cast.

6. When this adjustment is made, cement together the base-plates and backing with a brittle, resinous cement (resin, two parts; wax, one part; or sealing-wax will answer), and before the cement has fully hardened remove from the cast to position in the mouth, perfecting the final adjustment there. By this method much greater accuracy of adaptation is obtained, as the lines of length, width, and contour are too fine to be reproduced with absolute fidelity in a plaster model. In this part of the process too much care cannot be taken to have each piece of the appliance fitted with absolute accuracy to the surface for which it is designed. When this has been accomplished, throw upon the yet more or less plastic cement a stream of ice-cold water from an office syringe; this renders the cement perfectly brittle and incapable of bending. This done, immediately remove from the mouth and invest in a mixture of equal parts of marble-dust and plaster of Paris.

7. After the investment has firmly set, solder the base-plates to the backing, and the backing to the platinum-pins of the porcelain tooth, using as a solder 20-carat gold. Thus joined, the appliance will present the appearance shown in Fig. 5,—A representing the base-plate for the cuspid; B, the base-plate for the incisor; C, the porcelain tooth with its platinum backing; D, the points of union between the base-plates and backing. At these points the greatest strength is required, and it is important that here a large amount of the solder should be placed. The porcelain tooth being usually thinner than the natural teeth, there is nearly always an angle or depression at the points indicated, in which the thickness of the gold can be considerably increased without interfering with occlusion.

8. For the purpose of attaching the denture as thus far constructed, drill a small cylindrical opening through the palatal surface of the enamel of the cuspid and incisor respectively. These openings should usually be placed about as indicated in Fig. 4, at C D. Sometimes, owing to a close occlusion, or to the contour of the tooth, it is desir-

able that they should be located a trifle nearer the neck of the tooth. Each opening should be well undercut, but must not encroach upon the dentine far enough to endanger the pulp. In size the openings need not be larger than will admit a platinum pin-head, in diameter corresponding to 13, standard gauge, with a shank of 18, standard gauge. Into each of these openings must be fitted a platinum pin of the size indicated. The head of each pin must be made thin and perfectly flat both upon its upper and under surfaces.

9. In each of the base-plates make an opening corresponding in position to those in the natural teeth. Pass through these openings and cement in them the free ends of the platinum pins. While the cement is yet plastic, place the denture in position in the mouth, carefully pressing the pin-heads into the openings made for them, and burnishing the base-plates into perfect contact with the palatal surfaces of the teeth; chill the cement, remove and invest as before, and with 20-carat gold solder the pins to the base-plates, flowing upon them and the backing as much of the solder as may be necessary to give them the desired thickness and rigidity; the amount

Fig. 2.

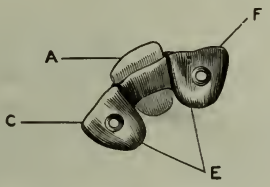


Fig. 3.

admissible largely depending upon the nature of the occlusion; a central thickness of about 21, standard gauge, being all that is really requisite for strength, while the edges can be made much thinner.

Fig. 2 represents the appliance without the pin. A is the porcelain tooth and backing; E, the base-plates; C and F, the openings for the pins.

Fig. 3 represents the appliance completed with the pins in position.

Fig. 4 represents the natural teeth and interspace B, with openings for retaining-pins, C D.

Fig. 5, already described, represents the appearance presented when the bridge is cemented in position.

To Attach the Bridge.

To attach the bridge the best attainable oxyphosphate cement should be used. It is desirable that it should set slowly. Thoroughly dry the teeth and denture; mix the cement to as thick a consistence as is compatible with perfect plasticity. A thick, viscid, semi-fluid mass is what is required. With suitable instruments, swiftly but

carefully place the cement around the head and shank of each platinum pin, and also in the openings in the natural teeth. This care is necessary in order to exclude all air-bubbles and thoroughly engage the pin-heads in the cement. They furnish ample retaining surface, but none to spare. In packing the cement around the pins the under surface of the base-plates should at the same time be covered.

The above details being perfected, the denture is at once carried to position, and with broad-pointed, serrated instruments pressed firmly into place, the excess of cement, if of the proper consistence, freely oozing at all margins.

Too much care cannot be exercised in the cementing process. As every second of time is of value, all instruments required must be selected and conveniently placed before the oxyphosphate is mixed. To secure the most rapid possible and at the same time the most thorough admixture of the phosphoric acid and zinc oxide, a thick plate-glass slab, four inches square, with a flat (not a concave) sur-

FIG. 4.

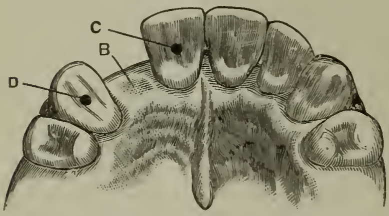
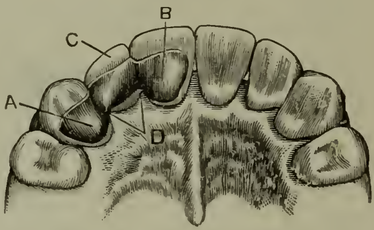


FIG. 5.



face, should be used. The spatula should be of steel, thin and elastic, and six-tenths of an inch wide. With these implements the whole mass of cement, acid, and oxide can almost instantly be brought into union, the spatula being used as a muller. When a narrow and rigid spatula is used in mixing any considerable amount of oxyphosphate, the process can be accomplished only in detail, portion by portion, much valuable time being thus lost, during which the setting process is every moment hastening to its completion and rendering the cement unfit for use in this or any other form of bridge-work. A large excess of acid will, of course, make a thinner and more slowly-setting mass, but a cement thus mixed is deficient in strength and too unstable to give good results.

A very troublesome obstacle to success in the use of the oxyphosphate cements will often be found in the temperature of the air, an elevated temperature so hastening those chemical changes upon which the hardening of these cements depends as to render their use almost impracticable. This difficulty is likely to occur only in

the hotter seasons of the year, and can readily be overcome by placing the mixing-slab, as well as the acid and oxide bottles, in cold water until their temperature has been considerably reduced.

During severe winter weather too low a temperature also gives trouble, the acid and oxide, even when the former is in some excess, forming a powdery mass utterly unworkable, but which melts down into an almost fluid condition when brought into contact with the warmth of a tooth *in situ*. A temperature between 60° and 65° F. secures the best results in mixing oxyphosphate cements.

Application to Pulpless Teeth.

In the above description the vitality of the pulps of the cuspid and incisor has been assumed; but, as can readily be understood, the pin and plate bridge can be even more readily and securely placed when one or both pulps are devitalized, for the reason that, the pulp-chamber being empty, the pin-holes in that tooth can be made as much larger and deeper as may be deemed desirable, the size of the pin being, of course, correspondingly increased. In a devitalized tooth, too, the base-plates can be sunk into the palatine surface when they interfere with occlusions, as sometimes happens when the antagonism of the lower teeth is very close and the overlap is considerable.

Ordinarily, however, such interference is inconsiderable, and the difficulty can always be overcome either in devitalized teeth by the expedient just suggested, or by carrying the base-plates as far away from the cutting-edge as practicable, at the same time making them at the point of contact as thin as is consistent with strength; finally, if necessary, removing a slight portion of the cutting-edge of the occluding lower tooth.

As experience with this as well as other forms of bridge-work has fully demonstrated, a slight mutilation of a natural tooth is far less destructive in its ultimate results than is the wearing of partial plates, in the use of which pressure falls upon the gum-tissue, with the ultimate effect of stripping it from around the necks of the natural teeth, thus denuding them of that protective covering, and exposing them to the ravages of decay, and it may be safely affirmed that in all applicable cases the pin and plate bridge accomplishes its purpose with the minimum of injury to the natural organs.

The small size of the retaining-pins may excite doubts as to the strength of the denture; but pins smaller in size are constantly used for attaching porcelain teeth to plates, and in the upper incisor series these pins are much less advantageously placed for resistance to pressure than are those imbedded in the natural teeth in the process above described.

The weakest point in the bridge is not the pins, but the cement;

but this, while not so strong as the fused porcelain which surrounds the pins in artificial teeth, is, as experience has demonstrated, just strong enough to resist all ordinary wear and tear, without being so intractable as to render the removal of the denture for purposes of repair a practical impossibility by any method short of its destruction.

Even with a good oxyphosphate cement, the work of removal is one of no slight difficulty, and requires the exercise of so considerable an amount of force that no one who has had occasion to perform that operation will question the security of any well-constructed specimen of this form of bridge. During an experience of some seven or eight years in their use, the writer has had but one or two cases in which the appliance became loosened, and only one in which it was detached outright. In the latter case the bridge (constructed with the natural tooth of the wearer instead of a porcelain substitute) had been firmly in position for more than a year, when the sudden wrench consequent upon biting into a very hard peach detached it. Being immediately replaced, it has since then (some two years ago) done good service. In such cases it is usually advisable to slightly deepen the undercuts in the pin-holes before replacing.

Repairing.

As in all other forms of bridge-work in which porcelain teeth are used, the accident most likely to happen is the fracture of this brittle material. As the bridge does not yield under pressure as does a detached plate resting upon the compressible gum-tissue, this form of breakage is one to which bridge-work is more than usually liable. For the pin and plate bridge the least difficult method of repair is to separate the tooth and backing from the base-plates by means of a watch-spring saw, and then force off the base-plates singly, this being much more easily accomplished than their removal when united to the backing. Another tooth is then selected, fitted, backed, and soldered as before.

As a rule the writer has confined the use of this form of bridge to cases in which only a single incisor is missing, but he has successfully attached a front and lateral incisor to a cuspid and the remaining front incisor. Where an unusual strain is to be expected the retaining-pins and pin-holes should when practicable be made correspondingly large, or two smaller pins may be anchored in one tooth, which latter plan gives very great resisting power and renders removal in the highest degree difficult and laborious.

Porcelain Tips.

Figs. 6, 7, and 8 show how the pin and plate process may be utilized

for the attachment of porcelain tips for broken or decayed incisors when the appearance of gold fillings is obnoxious to the patient. A represents the porcelain tips; B, the space to be filled by them; C

Fig. 6.

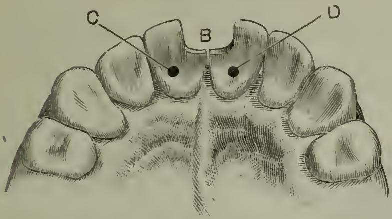


Fig. 7.

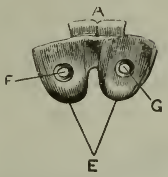
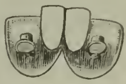


Fig. 8.



and D, the opening for retaining-pins; F and G, openings in the base-plates (E) for the pins. Fig. 8 shows the appliance with pins attached.

Pin and Plate Attachments to Bicuspids.

Although chiefly applicable to the incisors, the pin and plate attachment may be successfully combined with crown or bar bridges for molars and bicuspids.

Fig. 9.

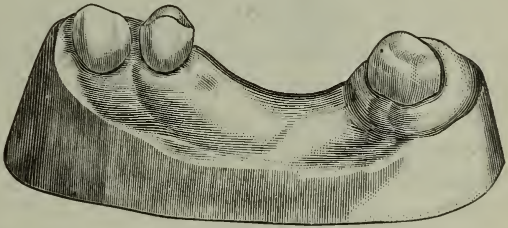


Fig. 9 represents a practical case in which the upper third molar and the first bicuspid (both without antagonizing teeth) were utilized for the attachment of a bridge made of gold crowns with porcelain facings, to supply the loss of the intervening teeth.

Fig. 10.

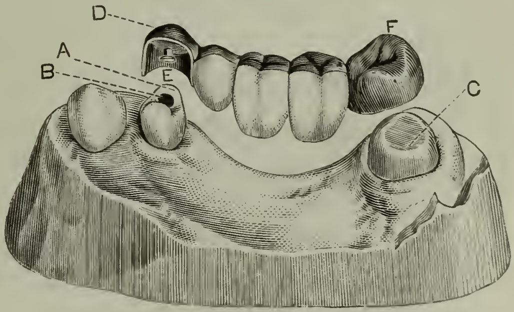


Fig. 10 represents the case as prepared for the bridge. A, the inner cusp of the bicuspid cut down to allow the placing of a sufficiently thick crown-plate; B, a cylindrical undercut opening between the cusps for a retaining-pin; C, the third molar, made uniform in size from neck to grinding surface, the latter also being considerably retrenched; D, the crown-plate of a partial cap, made of pure gold, soldered with 20-carat gold, and so constructed as

to cover every portion of the tooth except its buccal surface, the free edge passing up under the gum; E, a retaining-pin adapted to the opening B; F, the gold cap for the molar.

Fig. 11 represents the bridge anchored in position with oxyphosphate cement.

In the above case it will be observed that there is a considerable space between the bicuspid and cuspid. This made it readily practicable to give so considerable a thickness to the mesial wall of the partial cap as to hold it securely against the side of the tooth. Had the space been less, contact with the cuspid would have afforded the desired security.

FIG. 11.

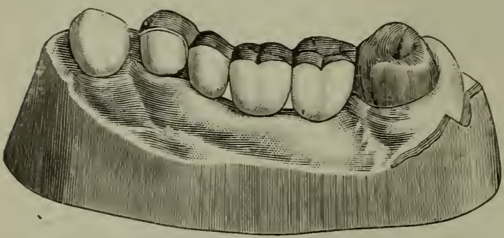


Fig. 12 represents another case in which a bridge was attached by a bar, partial cap, and retaining-pin. A is an upper second bicuspid (without antagonist); B, its inner cusp, cut down; C, opening for retaining-pin; D, second molar, with slot for bar; E, cuspid; F represents the partial facing; G, the retaining-pin; H, a molar crown of gold, with porcelain front; I, a platinum bar attached to the crown (H) and made to fit into a slot (at D); J, a plain plate cuspid, heavily backed and strongly soldered to the partial cap, but left without attachment to or contact with the cuspid.

FIG. 12.

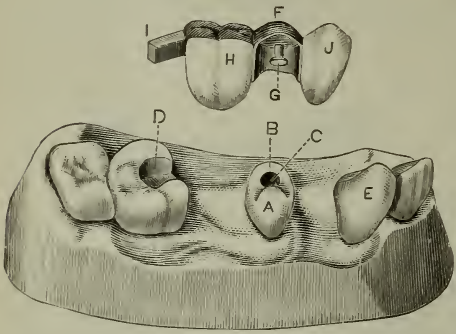


Fig. 13 shows the bridge anchored in position.

This case, after two years of wear, is still in perfect condition and doing good service. As it was possible to keep the gold attachments, backings, etc., out of sight, the appearance presented is very natural.

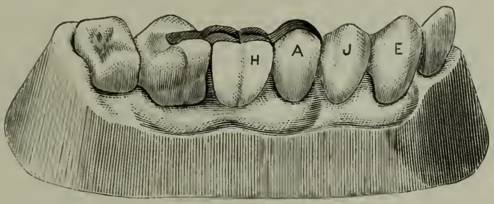
The bridge shown in Fig. 11 has been in use but a few months.

The absence of antagonizing teeth for the bicuspids in each of these cases was a favorable condition, as a considerable thickness could be given to the crown-plate without any interference with occlusion. When the conditions are not so favorable, cutting down the inner cusp to the required extent and sinking the opening for

the retaining-pin to the necessary depth are processes certainly to be, as a rule, preferred to the entire removal of the crown for the purpose of ferruling the root for the mounting of a crown of gold and porcelain,—a procedure, however, not by any means to be indiscriminately denounced, for in many cases it is in the highest degree advisable.

There is this fact to be considered in regard to the use of the partial caps here figured,—that many patients can be induced to consent to their employment who would refuse to submit to more radical measures, and thus, even when the latter would be advisable, the former may be employed as a compromise, or even as a temporary expedient. Having once tested the advantage of a well-fitting bridge, the wearer is much more likely to consent to whatever measures are necessary to give it security and permanence.

Fig. 13.



In the cases figured, however, as well as in analogous cases, these qualities seem to be amply secured. In every instance in which the removal of a pin and plate bridge has been necessary the film of oxyphosphate cement has been found intact, and the surface of the tooth upon which it rested perfectly protected from decay. The only exceptions to this rule have been the very few cases in which one or the other of the retaining-pins has become loosened, the bridge being for some weeks still worn in the loosened condition. Under such circumstances the cement will, of course, become detached and wash out, admitting food and secretions; but so long as the appliance remains immobile—and that is its normal state—the cement rests undisturbed. It need hardly be claimed that its durability is without limit, although under a metallic covering it appears to be practically so; but, under the conditions represented in the processes as above described, it is certainly good for many years of satisfactory service, and when it fails, through chemical abrasion, it will fail first at the free margins, where defects are most easily seen and remedied.

THE BAND MATRIX AND ITS USES.

BY S. H. GUILFORD, D.D.S., PHILADELPHIA, PA.

(Read before the First District Dental Society of the State of New York, January 5, 1886.)

The mechanical principle involved in the use of the matrix is so ancient, and of such universally recognized merit, as to scarcely need either an explanation or an argument to demonstrate its value.

Its most apparent usefulness consists in its enabling us to simplify the filling of a difficult class of cavities, by furnishing a temporary wall to take the place of the one destroyed by disease. Its earliest use for this purpose, in some form or other, is unknown, but it was probably a development rather than a discovery. It would seem to have been evolved from its contemporary or ancestor, the wedge.

A wedge placed at the cervical margin of an approximal cavity, to hold away and protect the soft tissues, by slightly overlapping the cervical border, probably suggested to him who first so used it its value in forming a pocket for the retention of the first portion of the filling. Being found valuable in its small extent, its extension so as to cover more of the cavity would readily suggest itself. The fibrous character of the wood, not being proof against injury from the plugger, led to its being superseded by a metal blank, which was most readily extemporized from the uncut portion of a separating file. This answered the purpose in a rude way until contour fillings came into vogue, which necessitated the use of a concave wall or matrix.

To meet this want in a practical way, Dr. Louis Jack devised his set of steel matrices, of varying sizes and thicknesses, and allowed them to be placed upon the market. They were a long way in advance of anything that had preceded them, and were indeed the first ones of any kind that were manufactured for the profession. Their very general adoption and use are the best testimonials as to their value, and they will long continue to form a part of the outfit of the well-equipped practitioner. With all their great value, however, they seemed to lack two essential characteristics of a perfect matrix. Their use required the near presence of a tooth other than the one operated upon, in order to retain them in position, and their being held firmly depended upon their being wedged tightly against the margins of the cavity. This latter condition often resulted in serious injury to the margins.

These objections to an otherwise very useful appliance led to the devising of a matrix which should depend solely upon the individual tooth for its retention, and which should not bind more heavily upon the necessarily friable margins than upon any other portion of the surface of the tooth. The band matrix consists essentially of a strip

or band of thin steel or other metal, encircling the tooth, and drawn tight and held in place by some device clamping the free ends. The first matrix of this type of which the writer has any knowledge originated with Dr. Robert Huey, of Philadelphia, at least a dozen years ago. The writer made one at that time after the doctor's pattern, and has used it at times ever since. The band consists of a flat and perfectly straight strip of platinum plate, about No. 28, American gauge, in thickness, and long enough to encircle the tooth and allow a projection of the free ends on the buccal surface. These free ends, bent at a right angle, were reinforced by the addition of small and heavier pieces of the same metal soldered to them. These ends were drilled to admit of the easy passage through them of a screw, one of the ends of which was filed square to admit of turning, and faced with a shoulder, while the other end was threaded and provided with a nut, giving the required tension when the screw was turned. It answered its purpose admirably wherever there was room for its introduction, or where there was opportunity for encircling the tooth. Several changes of the original form have since been produced by others,—some of them improvements, others quite the reverse. The principle involved in its construction—namely, a flexible band surrounding the tooth, with pressure evenly distributed, and adjusted and held in place by a delicate screw—has always seemed to be the scientifically correct one to be employed in the construction of a matrix.

In respect to evenly distributed tension and independence of an adjoining tooth in the matter of retention, the Huey matrix was a decided improvement on the Jack matrix, though this latter excelled in occupying only one interdental space, where the former required two.

Recognizing the virtues of both the Jack and Huey matrices, through a long experience with both, and yet being conscious of the limitations of each, it seemed desirable that a matrix should be devised embodying the good features of both without the objections of either.

With this end in view, the writer some years ago set himself the task of devising such an appliance for his own use, which, if found valuable after thorough practical experience, should be made useful to the profession at large. The principal object to be attained in its devising was a flexible band matrix, encircling the greater portion of the circumference of the tooth to be operated upon, yet occupying but one interdental space, and firmly held in position by a small and rigid clamp, which should not obstruct the view of the cavity nor be in the way of the operator. Incidentally with this, it was considered desirable to have it consist of as few parts as possible, be direct in its action, and simple and inexpensive in its construction.

The result of my efforts, which I show you to-night, consists of but two parts,—a flexible steel band, and a small steel clamp for adjusting the band and holding it firmly in position. The general form of the band is shown in Fig. 1. It is cut from sheet steel, five one-thousandths of an inch in thickness, and is made long enough to pass a little beyond the most prominent portions of the tooth on both the buccal and palatine surfaces. Its upper edge is either curved or straight, while the lower edge dips down at some point to cover the deep-lying border of the cavity. The width of the band, except at the deep portion, should nearly equal the height of the crown minus the cusps. The ends are rounded, and near their extremities a small hole is punched for engaging with the toe and screw of the clamp. A number of sizes are needed, varying slightly in width, but mostly in length, to accommodate them to the different sizes of bicuspids and molars.

Fig. 2 represents the clamp. It is cut from steel about three sixty-fourths of an inch in thickness, and from the main portion or back there extend two short arms at right angles. One of these

Fig. 1.

Fig. 2.

Fig. 3.

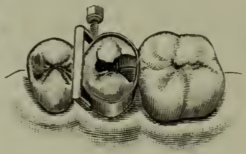
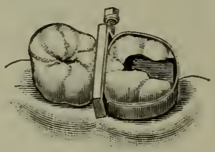


Fig. 4.



arms terminates in a conical point or toe pointing inward, while the other arm is flattened, drilled, and tapped to receive the screw. The inner edge of the back should be chamfered on both sides, so as to allow it to set well down and out of the way in the groove between the cusps of adjoining teeth. If there be no adjoining tooth, the clamp, after being adjusted, can be swung over and occupy the interdental space.

Preparatory to using, the ends of the band should be bent at a slight angle to the main portion, in the region of the perforations, so as to admit of their being drawn into the angle between the teeth without interference from the adjoining tooth.

In applying, the band should be bent in the form of a bow, and the holes caught over the points of the toe and screw of the clamp, care being taken to see that the clamp when in position will have the screw on the buccal surface. With the two thus united, the band is slipped over the tooth and pressed into place, the clamp dropping into the depression between the teeth. The screw is then turned by means of a watch-key, or some equivalent appliance, until the

band is drawn as tightly as need be around the tooth and firmly held there.

It will be readily understood that whenever the screw is turned the tension at the toe of the clamp will be as great as that at the point of the screw, thus obviating the use of two screws and obtaining the same result. In my earlier patterns the clamp was made larger and curved so that the bow might be thrown farther away from the points of engagement with the band, but it was discarded in favor of the present one, on account of its lack of rigidity, unless made too heavy for convenience.

Figs. 3 and 4 show the matrix in position on a bicuspid and molar respectively. Three sizes of the clamp are needed ; one for use with bicuspids, another to lie between molars and bicuspids, and the third for use in connection with the molars alone.

The shallowness of the clamp, in connection with its resting upon the crowns of the teeth, effectually prevents the band from slipping up into the gum. Should the dipping portion of the band not lie quite close to the neck of the tooth, it may be brought up and held there by a small orange-wood wedge if there be a tooth posterior to it.

It may be said of this as of other matrices that, while they may be used in connection with a cavity involving only the mesial and crown surfaces of a tooth, they are all of most service in the filling of distal compound cavities.

When a matrix is used in the filling of a mesial compound cavity it necessarily excludes the light, limits the room of the operator, and casts a shadow; while, used on the distal surface, it illuminates the cavity by reflection, and is entirely out of the way. While the band matrix is intended principally for use in connection with compound cavities, it may also be made serviceable, with a slight modification, in the filling of a very difficult class of simple approximal cavities.

Every practitioner, at times, meets with small simple cavities situated midway or near the neck on the approximal surfaces of the bicuspids and molars. Where the arch is not crowded or the teeth not too firmly set, there is usually no difficulty in wedging the teeth apart sufficiently to fill these cavities satisfactorily, but where there is no time to separate, or where the cavities are situated so near the cervical border that separation even would not greatly simplify the filling of them, we have but two alternatives to choose from in the matter of obtaining space. Either we must cut down from the crown, converting the simple cavity into a compound one, or we must continue the simple cavity out to the buccal surface, and fill from that direction. The first plan, although practiced by some

operators, involves the cutting away of too much good tooth-structure to make it either commendable or desirable. The second plan, decidedly the better one, gives us an oblong, shallow cavity, requiring the utmost care and skill to fill properly.

To assist in the filling of such cavities I have modified the band shown in Fig. 1, by slotting it in the direction of its length at a point opposite the buccal opening of the cavity. The slotting of the band gives us an ear, which in use is bent outward to lie over the bucco-approximal angle of the adjoining tooth. This band, placed in position and held firmly by the clamp already described, forms in connection with the cavity an oblong pocket that is readily and quickly filled. The band, separately and in position, is shown in Fig. 5,

For the filling of a double compound cavity,—one involving distal, mesial, and masticating surfaces,—a band will be required having a dip near each end, as shown in Fig. 6, and the clamp will then have to be placed entirely on the buccal surface.

A more suitable and convenient clamp for use on the buccal sur-

Fig. 5.

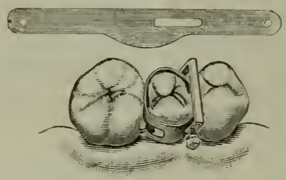


Fig. 6.

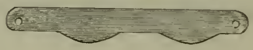
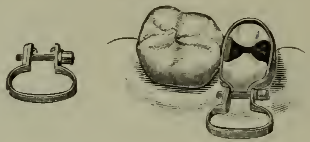


Fig. 7.



face is shown separately and in position in Fig. 7. The bow portion, which is small, is made thin, so as to be elastic, while the projecting arms are heavy. These arms have a foot-shaped pin inserted on their inner sides, facing each other. Between these pins and the bow portion each arm is perforated to accommodate the screw. The hole in one arm is tapped to receive the thread of the screw, while the hole in the other is made oblong to afford play for the screw in its action. The screw itself is similar in shape to the one used in the clamp previously described. The ends of the band to be used in connection with this clamp should be perforated by means of a pin-punch near their extremities. In use, these holes are slipped over the foot-shaped projections on the clamp, and the band, after being placed in position on the tooth, is made tight by means of the screw.

The same clamp and band can also be used, when desired, for the filling of a single compound cavity where natural space exists for its introduction in the first interdental space anterior to the cavity. The band to be used in this way should be shaped as shown in Fig. 8, with the dip near one end of the band.

Closely related to the use of the matrix, and all-important in its bearing upon the future serviceableness of the tooth, is the question of the proper shaping of the cavity for the introduction and retention of the filling.

A compound cavity of the class we are considering involves in its extent a greater or less portion of the approximal surface and a portion of the crown. Two methods of shaping such cavities have generally prevailed. The one and older method consists in making the cavity as wide in extent on the masticating surface as on its approximal aspect, thus giving the lateral walls quite or nearly parallel sides. This is done for the advantage it gives in the introduction of the gold. To retain the filling the lateral walls are somewhat grooved or undercut throughout their whole extent, from the cervical border to the masticating surface. If the adjoining fissure is involved in decay, it is cut out and joined to the main filling, but is made to bear no part in the way of retaining it. A cavity thus prepared is shown in Fig. 9.

The other plan consists in not having the cavity so widely opened on the masticating surface and giving it an entirely different shape. The approximal portion of the cavity is allowed to retain the shape

FIG. 8.

FIG. 9.

FIG. 10.

given it by decay or by the preparation it has received. The fissure portion is prepared in the usual way, and the end most distant from the approximal cavity is enlarged laterally until it somewhat resembles the head of a dumb-bell. The other end of the fissure is widened out by radiating lines until at the peripheral border of the crown it is as wide as the mouth of the approximal cavity. The filling introduced into a cavity of this description depends for its retention upon a slight inward inclination of the cavity at the neck, and slight undercuts along a portion of the lateral walls; but it is made additionally secure by being well tied into the crown by means of the fissure filling with its enlarged distal end. Fig. 10 shows a cavity thus shaped.

The advantage claimed for the first method is that a cavity so shaped is better illuminated and more easy to fill, but the manifest objection to it consists in the fact that the tooth is materially weakened by excessive and unnecessary cutting.

By the second plan no more good tooth-structure is removed than the necessities of the case require, and the tooth in consequence is not unnecessarily weakened. In addition to this, the manner of

securing the filling is quite equal, if not superior, to that of the former method. With the mouth of the cavity less widely opened, as it is by the latter method, it may be slightly more difficult to fill, but by the use of the band matrix, properly fitted to the tooth, this difficulty is reduced to a minimum.

The objection has been urged against all matrices, and with much truth and reason, that their use is attended by the danger of not having the gold perfectly adapted to and impacted against the lateral walls. Certainly their use involves additional care and cautiousness. But with these conditions properly observed there is no good reason why a filling introduced with the aid of a matrix should not be as perfect in every particular as one introduced without it. It is far better to observe this care than to dispense with the valuable assistance rendered by the appliance.

Could a band matrix be devised that would so accurately fit the tooth as to lie in close contact with the margins of the cavity throughout the entire operation, there would indeed be very great danger of the gold not being perfectly adapted to the walls at their margins. Such, however, is not possible; hence under the repeated blows of the mallet in the introduction of the filling the band slightly and slowly yields at the margins, while it is being drawn more closely to the tooth at all other points. This enables the cavity to be made slightly more than full throughout its whole surface, and, while it more surely secures a perfect fit at the margins, it affords just the little excess needed for dressing down and finishing the filling.

It was said in the beginning of this paper that the most apparent use of the matrix was its simplifying the act of filling, but this by no means constitutes its only merit. In addition, the band matrix gives us a filling which when completed represents in its outline the exact contour of the tooth, with a little surplus. By its use there is no excessive building out of the tooth, and hence no great amount of dressing down in the finishing.

An excess of gold in a filling means loss of time and material in its introduction, and loss of time and great pain and annoyance to the patient in its removal. All this is easily avoided, for, after the removal of the band matrix, a little dressing of the margins with a plug-trimmer and a few moments' use of the tape or paper disk completes the finishing to the satisfaction of both patient and operator.

The increased attention given to the subject of matrices by the profession within the past year or two would prove, if proof were needed, the general esteem in which they are held as important factors in the simplifying of difficult work. We do not hesitate to express the belief that by their more general and careful use the average quality of the fillings of the future will be greatly raised,

and, if the little appliance shown you this evening shall in any measure contribute to that end, your essayist will consider himself fully repaid for the time spent in its devising.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting Tuesday evening, January 12, 1886, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The vice-president, Dr. J. Morgan Howe, in the chair.

Incidents of Office Practice.

Dr. Charles Miller. I have here the model of a case that I presented to this society a year ago,—that of a lady twenty-three years old, whose lower teeth were crowded and much more prominent than the upper ones. I extracted the lower first bicuspids, and drew the incisors and cuspids into their places under the upper teeth in ten weeks, using this appliance, which caps the lower molars, the gold bar which passed in front of the incisors being secured to the caps by strong elastic bands, and exerting a constant pressure upon the teeth. This second model shows the result of the operation, which was accomplished with this one fixture, the rubbers being changed occasionally. The teeth are not entirely firm yet, but are gradually becoming so, and you will notice that the upper ones are also much improved in position; nothing, however, having been done to them except to remove the misapplied pressure of the lower teeth.

Dr. W. H. Dwinelle. I have a patient who has but few superior front teeth, but upon them depends mastication and the articulation of the jaws. The lateral incisor, by being pounded upon in mastication for a long time, was ultimately broken off quite near the margin of the gum. I desired to save the pulp of the tooth, which was still alive, and also wished to restore the masticating surface lost to the patient by the fracture. I therefore inserted two gold screws in the dentine, one on each side of the pulp-canal, and built a gold crown of crystal gold around them, the screws, combined with some little irregularities of the tooth itself, furnishing the means of security and attachment. That crown remained there fifteen years, being subjected to great mechanical attrition and abrasion, as you will see by examining it, the marks of the antagonizing lower teeth being very apparent. Ultimately, because of this continual hammering, the crown broke off obliquely above the gum, the two screws which were located on either side of the pulp remaining

in their places within the gold crown. The pulp having died from the effect of a very severe cold the patient had contracted, I treated the root and placed on it what is now popularly known as the Sheffield or Richmond crown. It was not so called thirty odd years ago.

I here present a left superior second molar that I first saw in the year 1856 when it was ulcerating. I succeeded in healing the abscess; then filled the roots with gold, and contoured the crown. During my absence, about three years ago, the patient took a severe cold in his face, and went to a dentist, who extracted this tooth, which operation did not relieve him in the slightest degree, and it was found that another tooth—which I afterwards treated and saved—was the cause of the trouble. The root of the tooth which was extracted was, as you see, greatly exostosed.

A number of years ago I was in the habit of treating teeth, one or more of the roots of which had lost their vitality, by amputating such roots, and here is a specimen showing how nature will adapt herself to extraordinary circumstances. I excised two of the roots, leaving one, and the tooth did good service until, in the course of time, it was extracted.

Here are other specimens of teeth which did good service for fifteen or twenty years after I had amputated one or more of their roots.

At the time of the destruction and removal of the old post-office in Nassau street, which was the old Dutch Church, I was present when they were taking away a lot of skeletons, skulls, etc., that had been deposited there many years before, and in a handful of teeth which I picked up found a lower cuspid which had two roots instead of one, and present it for your inspection.

The President. These are very interesting specimens of disease and of excellent workmanship. Had this tooth, the root of which is so greatly exostosed, an antagonist in the opposite jaw?

Dr. Dwinelle. Yes, sir; as you will see by noting the marks of antagonism which are so apparent upon its crown.

Dr. S. E. Davenport. I am sorry Dr. Atkinson is not present to-night, as I have often heard him say that he would give a Delmonico dinner to any gentleman who would present a case of exostosis upon a tooth which had an antagonist in the opposite jaw. I should have been pleased to have heard his remarks upon this report of Dr. Dwinelle's, with the accompanying voucher.

Dr. Dwinelle. I have the utmost confidence in Dr. Atkinson's promises, and because of that confidence I invite you all to the Delmonico dinner.

Dr. F. Y. Clark. Here is a case in point. This tooth was recently extracted, and shows very severe exostosis upon its root. You

can see the grooves in the crown where it met the under teeth, proving that it was pretty well antagonized.

Dr. Dodge. Is it certain that the antagonism and the exostosis existed at the same time? Those marks would remain if the opposing teeth had been lost, after which exostosis might occur.

Dr. Clark. I noted that point very particularly before the tooth was extracted. It was antagonized at the time of the extraction upon the posterior and anterior surfaces, coming in contact with two other teeth. During the last fifteen or twenty years I have seen many teeth whose roots were exostosed, and not one was discolored, even where the pulp vessels had been completely severed and the foramen filled with exostosed matter. I do not pretend to give you the reason for this, but it seems important as bearing upon the causes of discoloration of dead teeth. This is simply the result of my observation, and may not hold good in all cases.

Dr. Wardwell. In 1875, when we were all talking about capping pulps, I had occasion to cap the pulp of a right superior first bicuspid. Three years later, the cement filling having worn down considerably, I removed it and examined the pulp to see what condition it was in. Upon removing the little paper that I had used for a capping I could see the pulp alive, and noticed that no deposition of any kind had taken place. I put back the same capping-paper, using a little shellac to keep it in position. In December, 1879, the lady came and said the tooth was aching quite badily. I removed the filling and refilled the tooth, which seemed to be all that was necessary. In November, 1881, the cement filling had worn down again, and, everything seeming to be quite comfortable, I filled over the bone filling with amalgam. I saw nothing more of it until a few days ago, when the lady came in and said there was something the matter with the filling. I found it had bulged out, and seemed to be loose, and when I took it out for the purpose of refilling the bone filling all came away with it. Upon examining the pulp I had capped in 1875, I found quite a deposit of brown secondary dentine. The pulp was nicely protected, so that it was not necessary to replace the paper, but simply a layer of cement, over which I placed an amalgam filling. When I cut a little to make the cavity deeper it was very sensitive, proving that the pulp was as much alive as ever.

The President. Has Dr. Wardwell generally been successful in saving exposed pulps?

Dr. Wardwell. I have had many failures, as I believe most dentists have, but on the whole I have been well pleased with the results of my efforts.

The President. We will now hear from Dr. Bronson, who has kindly consented to talk to us this evening on the subject of

Dead Teeth.

Dr. W. A. Bronson. The interest which is always shown when the treatment of devitalized teeth is mentioned in itself indicates that such treatment is an uncertain problem, and in a measure must always be so, as it is in all pathological conditions.

There are so many elements of difference in cases, that no fixed rule can be made. Temperament, structure, physical condition, and all the thousand and one influences which constantly affect us, must influence treatment. So that what for the time being we may or may not do is a matter of judgment. What might safely and successfully be done at one time, at another time might create a disturbance fatal to the tooth. Teeth with devitalized pulps are constantly being presented and must be cared for. One case treated after a certain method is successful, and the dentist flatters himself that he now knows all about the subject. The very next case will perhaps present very unfortunate features, to his utter discomfiture. One condition should always be secured, viz., direct and free access to pulp-canals. For instance, if the exposure is on the posterior approximal surface, and a double corner is to be turned, do not hesitate to go direct to the pulp-cavity through some other part of the tooth. It is comparatively easy to supply the loss of tooth-structure with something more indestructible than tooth-substance itself.

I have in mind one interesting case of which I would like to speak. A second lower bicuspid, the pulp of which must have been dead some years, was treated by me pretty thoroughly with iodoform, the pulp-canal having been washed out with chloroform and warm water. It grew worse for a day or two; and then, acting upon a hint from Dr. Atkinson, I applied carbolic crystals to the gum and cut it, making one slit perpendicular and the other transverse, and with a drill in the engine I went directly through the process to the end of the root. The face was swollen a little the following day; but the tooth recovered sooner than any tooth I have treated that was equally diseased. I attribute that speedy recovery very largely to the free access I made through the gum.

Whenever I open into a pulp-chamber which contains a putrescent pulp, I either dip the end of the drill in corrosive sublimate or saturate the cavity with the drug at the moment the air enters.

Dr. Streeter. What solution?

Dr. Bronson. It is the officinal preparation; I think two grains to the ounce. The point which I would make would be the good effects resulting from the use of an antiseptic at the time the pulp-

chamber is entered. Of all the methods for ascertaining whether the pulp of a tooth is dead or not, I think the best is the use of the electric light, which I find is almost infallible. There are several methods of treating teeth when periostitis exists. One of the most successful is to put on the rubber dam, cleanse the pulp-canal as thoroughly as possible, washing it out with chloroform, and then apply hot air continuously until the pain subsides. I am indebted to Dr. Bogue for this idea.

Perhaps the best filling for roots of teeth is oxychloride of zinc; but it is not always desirable to use that. When I wish to avoid the possible escharotic effect of oxychloride I use a mixture of zinc and creasote, made slightly plastic, so that it can be carried quite to the end of the root, then filling the main cavity so that the stopping can be readily taken out should occasion require it.

Dr. Raymond. About a year ago I thought I would try the heroic method of going through the process to the end of the root in certain cases, but I have not had the courage to do it, although I have felt that it was the best treatment. I am very glad that Dr. Bronson has spoken of it to-night, and has given us such clear testimony. I would like very much to hear if others in the room have adopted the same plan, and, if so, with what success. I called upon a gentleman a short time ago, and in speaking about this method of treatment he told me that he had practiced it for years, and had written a volume or two on the subject. While the plan was not entirely new to me, it seemed to be a very old story with him. I have felt very anxious to learn if others have adopted the method, because it seems to follow the principle of making an artificial sinus in the first stages of ulceration.

Dr. Lord. Is the principal object in drilling through the process to secure an artificial sinus, or is it simply to get at the ulcer when it cannot be reached and properly treated through the foramen?

Dr. Bronson. My object is to get an opening to the end of the root to relieve congestion and to secure a free discharge of pus should there be suppuration.

Dr. A. H. Brockway. I did not suppose this treatment was considered at all new by anyone. It certainly has been mentioned a great many times. I have been in the habit of performing the operation occasionally for some years, and usually with excellent results. I do not recall a case where there was failure to relieve the periodontitis and inflammation. I have had one or two cases where the discharge of pus was not entirely stopped, but in all other cases of this kind I have had complete success. Of course, if the periodontitis has set in there can be but one of two results: either it will subside by resolution or pus will form, which must find an outlet. If you

can produce an artificial outlet you save the patient all the pain that is incident to the pus finding its way through the process; and I believe that the very act of cutting through there will in the early stages prevent suppuration.

Dr. W. T. La Roche. I have practiced this method of treating ulcerated teeth for a long time. The object that I have in performing the operation is to relieve the patient of pain and to remove the diseased periosteum from the root. I cut through the process with a bur, making plenty of room about the root, washing it clean with carbolic acid solution, or other disinfectant, and keeping it open. I believe that in almost all cases there has been a reproduction of the bone about the root. I first clean the pulp-canal thoroughly, and fill it permanently, if the tooth is not too sore. If it is, I fill it temporarily, and treat it if necessary through the artificial opening. I do not remember that I have had any failures.

Dr. C. B. Parker. Dr. La Roche says he reaches the root with the bur. The last time I used the bur in that way it slipped on the process and I tore the gum quite a little. In order to guard against such accidents, I made a lance-drill for the engine, with which I can go through the gum and process surely, without danger of deviating from the proper direction.

Dr. E. T. Payne. When there is inflammation after a devitalized tooth has been treated, or an artificial crown adjusted, which cannot be controlled by topical treatment, it is my practice to treat cases confined to the front teeth and the bicuspids by opening through the alveolar border to the seat of trouble at the end of the root. Properly performed, it is not as severe an operation as is generally supposed, or as the removal of a root filling, and in my experience is far more effectual. After obtunding the gum with cocaïne, make a small slit with a very sharp lance; take a minim engine-bur and shape it on an oil-stone until it resembles a spade drill, and with it the alveolar border can be penetrated without difficulty. Larger burs readily follow the first drill until the camp of the enemy is reached. Syringing the parts with tepid water is all that is needed to give relief in many instances, but with a delicate syringe any drug which seems to be indicated can be put in the cavity.

Dr. F. Y. Clark. I cannot understand why such a heroic and barbarous practice should be adopted to accomplish a simple thing. The object is to get at the end of the root of the ulcerated tooth, where the trouble is. Nature has made a natural canal to that place, and ninety-nine times in a hundred, with due perseverance and skill, the seat of the disease can be reached and the trouble corrected through that canal without resorting to the practice referred to. You cannot always tell whether the instrument is going to the

apex of the root or not. You can make a pretty good guess with the superior incisors and bicuspids, but what certainty have you of reaching the apex of the root of a second inferior molar or a first or second superior molar? I do not understand from what has been said at what stage of the disease this practice is recommended. Is it in periodontitis, or is it for removing pus that is already formed there? There seems to be some uncertainty in regard to that. I have done it as a last resort, after the roots have been filled.

Dr. J. W. Clowes. The subject of dead teeth is full of interest, and none the less so when we consider their variety as well as condition. Among the pleasant recollections of my last summering is that of a nice old gentleman whom I met on one of the steamers plying daily to ports on the north shore of Long Island. We had become somewhat acquainted, when one day he approached me with this question, "When a person has been to the dentist professionally, has he a right to expect comfort as a result?" I replied that dentistry was a positive science, and that the outcome of its practice should always be happiness. He went on to say: "For many years I employed the same dentist, until by his advice three of my most valuable teeth were extracted, and then I concluded to make a change. I remained for some time in great uncertainty as to whom I should employ, when I read in the papers what a distinguished dentist had done for some great man in the land, and, regarding it as my opportunity, I went at once to his office and placed my teeth unreservedly in his care; and yet I fear there has been a mistake, for my days are joyless and my nights without sleep." I assured him he had been in very distinguished hands, and advised that he should return to them for relief. To which he replied, "I have returned again and again without any benefit, and I shall go there no more." He asked me to take charge of his teeth, and on being seated in my chair pointed out what he called "the most troublesome tooth in his mouth." Having examined it carefully, I said, "This is entirely a matter of prejudice. You have suffered because your dentist does not approve of nerve-killing. This tooth is a middle molar of the lower jaw, and has been worn away by mastication, and made sensitive and loose by this and mal-occlusion with the upper teeth. It is a victim to chronic irritation, but the safety-pocket can bring you peace. I will destroy the dental pulp, and you shall lie down tonight with the assurance of rest, and the sleep of childhood shall refresh you again. In a few days my patient came back, and the joyous expressions on his face declared my promises fulfilled. Having removed the dead pulp, I filled the cavity with amalgam, and thus one victory was gained. The next tooth to which I gave my attention was a molar of the upper jaw,—a tooth so dead and dirty that

it fairly reeked with pus and pestilence! I found it a very vial of wrath, for which nothing had been done by the dentist of distinction. After cleansing and disinfecting, I filled this tooth, and the second victory was won. Just anterior to this molar were two bicuspids which had been filled with gold, in their bucco-labial surfaces, and from incautious excavation and maletal impact two more pulps were dead. As these were recent creations from the hand of eminence, they had not yet come to an ulcerative state, and, when judiciously treated and filled, added two more triumphs to my list. The right lateral incisor of the upper jaw had been filled with gold for several years, but at the apex of its root was a burrowing ulcer which a half-removed pulp had permitted to exist. I explained to my patient that the treatment of this tooth would probably involve some local disturbance, in which case he had only to report and have it readily controlled. The expectation was realized, and a puffed-up lip and very serious look were eloquent in their call for relief. Up to this time the road to happiness had been a royal one, but now there was a jolt in its course, and the inquiry came as to whether there was not such a thing as doing too much. "Ah," I said, "that is possible, but it has not been here. An insidious danger, a sleeping evil, has been aroused, and now it shall be effectually overcome." A few rotations of the spear-point drill made an opening to the apical sac, and then our record of the dead redeemed was finished and complete.

Dr. N. W. Kingsley. That all sounds very well and seems like a romance, but I would like to inquire what became of the distinguished dentist.

Dr. Clowes. This eminent professional is still around; in fact, he has many duplicates, and the pity is that with all his brilliant parts he lacks the one essential of practical usefulness to make him great. The nice old gentleman who trusted him felt hurt at his neglect. The failure to comfort, that came of prejudice, unsettled hope, and hope dismayed bore fruitage in disgust. Beware, my friends, of prejudice. No judgment can be wise, no trial fair, that rests on prejudice.

[Here followed papers by Dr. Benjamin Lord, on "Judicious Extracting," and Dr. Samuel F. Howland on "Artificial Crowns," with discussions, which we are obliged from press of matter to defer until our next issue.—Ed. Dental Cosmos].

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

At the meeting of the First District Dental Society of the State of New York, held Tuesday evening, November 3, 1885, in the rooms of The S. S. White Dental Manufacturing Co., Broadway and Thirty-second streets, New York City, J. N. Farrar, M.D., D.D.S., delivered the following address, illustrating it with chalk pictures on the black-board:

Mechanical Appliances for Regulating Teeth.

Mr. President and Gentlemen: I propose to confine myself this evening principally to apparatus that I make and use.

In deciding on a regulating device, I throw out entirely the question of expense, not caring whether the cost of constructing is two or twenty dollars, so long as it is the best, enables me to do the work the easiest, and causes the least pain to the patient. Some things that I tried in past years and was enthusiastic over I have abandoned and replaced with better ones. I would like, however, to convince you that the prevalent idea as to the apparatus advocated by me being complicated is mainly an error. I would also like to make it clear that the construction of the apparatus is not difficult, nor expensive, unless desired.

Instead of speaking of special cases, I will confine my remarks chiefly to principles, for if principles are understood there will not be much difficulty in mastering the details.

Fig. 1.

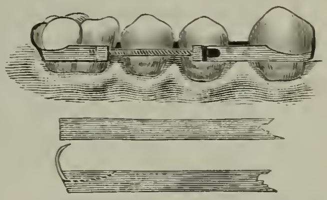


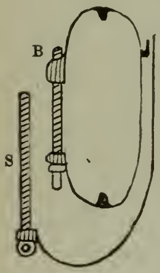
Diagram illustrating the proper form and application of a Clamp-band.

Apparatus.—Perhaps the simplest and most frequently used device is the clamp and anchor band, consisting of a bolt and a band, with a nut soldered on each end (Fig. 1). This is not only simple, but very efficient. (See the Dental Cosmos for January, 1876.) For illustration, take a case of the upper jaw with a cuspid standing outside and a lateral inside of the proper line, the bicuspids and first molar (sound) being in position, where to enlarge the arch sufficiently to make room for the outstanding cuspid would cause the front teeth to protrude too far forward. Which tooth should be extracted in order to obtain the best effect? Under such circumstances, if the space resulting from the removal of the first bicuspid would be entirely filled when the cuspid and lateral were drawn in line, I would extract the first bicuspid in most cases, provided the apex of the root of the cuspid was so situated as to not improperly incline it; but if by removal of that tooth it would cause an unsightly space, I would extract the second bicuspid instead,

and draw the first bicuspid back, only so far as to make sufficient room to let the cuspid and lateral teeth into line, because, should there be any space left, it is better to have it as far back as possible.

Let us assume that the second bicuspid is extracted. The next step would be to put a clamp-band (B) around the molar, extending forward sufficiently to inclose the first bicuspid; then tighten it by a bolt with a globular head (to prevent irritation), having a hole through it for a lever-key. Having drawn the first bicuspid back against the molar, an additional or splice-band (S) is then added, extending from a hook soldered on the lingual side of the clamp-band (now an anchor band, Fig. 2); thence extending forward around the cuspid and bolted to the rear (triple) nut (Figs. 2 and 3) of the anchor-band. But suppose the cuspid should stand too far outside to be drawn in line by feeding the band around in that direction, then it would be better to first catch the splice-piece on to the buccal side of the clamp-band, thence around the cuspid in the opposite direction, connecting it with a swivel screw inside to the clamp of the band. (Fig. 12.)

Fig. 2.



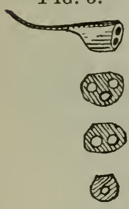
Anchor-band and Splice.

By the gradual turning of these screws, the outstanding cuspid will move into position very easily. After this the lateral can be drawn out by tying it to a long gold band, extended from the triple nut of the anchor-band forward around the front teeth to the opposite side, and screwed to another clamp-band (Fig. 27). All nuts should be non-irritating by being made rounded and smooth. These little bands also should always be made of *rolled gold* or *platinum wire*, because stronger than plate. Plate is worthless.

Dr. Hodson. I would like to ask Dr. Farrar if he finds any molars that aggravate him by falling forward.

Dr. Farrar. Yes; but I will reach that point soon, and then explain.

Fig. 3.



Single, double, and triple Nuts.

Bridge Device.—A number of years ago I published a description of a device that belongs to the class of operations which we are talking about. It was for drawing outward an instanding cuspid, and consists of a clamp-band around the bicuspid teeth, with a gold bar extending from the buccal side forward, over the open space like a bridge, the other end resting on the lateral incisor beyond, to which it was lashed. At that time I used detachable nuts for tightening clamp-bands, but now I use a parallel bolt (Fig. 2). A little band was then fitted around the cuspid, and to prevent its slipping this ring had a little point soldered inside, which fitted into a pit made in the tooth. To this was soldered a screw, filed flat on two

sides, which extended through an oval hole in the bridge, with a nut outside. (See Fig. 29, DENTAL COSMOS for June, 1878.) By tightening the nut, the cuspid easily moved into line. This is a fixture not easily dislodged.

FIG. 4.

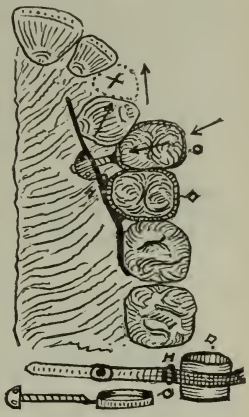


Fig 4 illustrates a similar device, soldered to a ferrule, to correct irregularity, caused by too long retention of the temporary cuspid.

Triplex-acting Loop.—I cannot very well pass over another little device (Fig. 5), described not long ago in the DENTAL COSMOS, because by means of it we can do so much. It is a triplex-acting device from one screw, a sort of *multum in parvo*, for such cases as instanding laterals or bicuspids. Formerly it was necessary to first move adjacent teeth away from them in order to make a little room (for this does not apply to cases requiring extraction). This device is made by soldering the sides of a nut to each end of a little thin strip of rolled wire, not exceeding one-sixteenth of an inch in width. One of these nuts is threaded; the other smooth-bore, into which plays the pivoted end of a screw. (Fig. 5). In use the band is passed around the instanding tooth, leaving the nuts outside, between which is fixed the screw, which when turned forces them and the adjacent teeth apart, and at the same time draws the instanding tooth up between them. I do not know of any little thing so satisfactory in its behavior,—a little troublesome by slipping, but that may generally be prevented by a little ferrule set with cement, or by a band with lugs or ears extending from the screw over the cutting edges. (See the DENTAL COSMOS for November, 1884.)

FIG. 5.

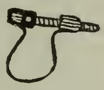


FIG. 6.

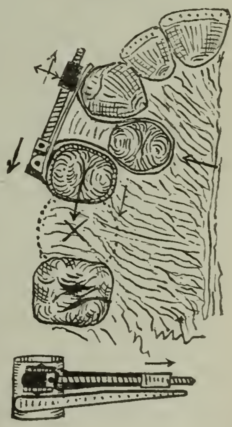


Fig. 6 illustrates a modification of the triplex-acting device, soldered to a ferrule set on a tooth with phosphate of zinc, and having also a finger alongside of the screw to prevent its slipping.

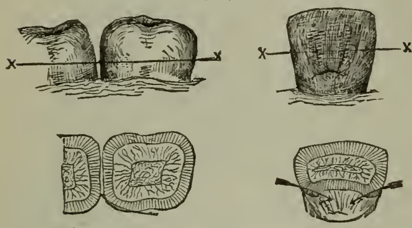
Dr. Abbott. In case the lower teeth shut outside of that lateral, do you put any apparatus between the teeth to keep them apart?

Dr. Farrar. Years ago we used what were called "gags." I do not think I have used a gag in ten years. I find that patients will not bite on such teeth, because they are "tender." On the opposing teeth of a child that

has not attained years of intelligence, however, I sometimes place an inclined plane, which meets this end, and at the same time assists the operation.

In regard to the question of slipping. If the teeth are shaped advantageously there will be no trouble so far as this part of the tooth *per se* is concerned; but sometimes it is very difficult to secure a fixture on a tooth that is short and tapering. In such cases I sometimes grind a slight hollow (Fig. 7), or perhaps make a little pit, in the lingual surface of the tooth, as before mentioned. Some people would not do this; but it is a very small cavity, which, if filled with gold afterwards, will do no harm. We can see a number of natural cavities in the teeth, and think nothing of it, but some persons are frightened by the mere idea of making a little pit as suggested. We all know that a small cavity which is made artificially may sometimes remain open for years without decay, while a little cavity that is caused in the first place by decay, although excavated nicely, will soon decay again, showing that a pathological condition of the tissues extends considerably beyond the cavity proper. A bit of wire set in a cavity with cement works well.

Fig. 7.



Teeth showing the line of bearings for Regulating Bands. The points, x x, of re-shaping (harmless) indicated by arrows.

Falling Forward of Teeth in Regulating.—We have now come to Dr. Hodson's question,—the "falling forward" of anchor-teeth. They do often move forward, but *this is sometimes an advantage, where we desire to close wide gaps.* But let us take one of the most difficult cases, where the first molar is so badly decayed that it is proper to extract it, leaving a wide space between the second bicuspid and second molar, and it is desirable to force the cuspid and two bicuspids back to let in an outstanding cuspid and an instanding lateral incisor. Sometimes the second molar, when necessary, may be held fixed in place by a skeleton roof-plate, fitted so as to bind within the arch, leaving room along the track of the desired operation. Full plates may be used, but they are so filthy that I have now abandoned them as unnecessary in operations for regulating.

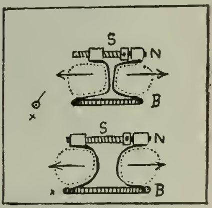
In these cases I have been quite successful, but I admit that they are troublesome. In cases of insufficient anchorages, I adopt one or both of two plans,—the drawing and the pushing. To draw, I place around the second molar (if firm) and the second bicuspid (to be moved) a clamp-band, and draw the bicuspid into the socket of the extracted first molar as nearly as possible.

Of course the second molar advances forward a little, but to prevent this in excess, and at the same time assist, I force a wooden wedge between the bicuspids, and then take up the slack in the band as fast as the bicuspid moves backward. Suppose I do start the molar a little; there is no harm, unless I need the room. Having brought these two teeth together, the clamp-band is allowed to remain, and a splice is added as before explained, and passed around another tooth forward, and with a screw in the triple nut of the clamp-band, aided by a wedge, it is forced back to the last-moved tooth. This is not hypothetical; I have proved it over and over again. When those teeth are drawn back and a sufficient space is secured for the cuspid, and it is not proper to longer use the molar for anchorage, a jack-screw across the mouth may be used to draw the cuspid into position. (Fig. 13). As a general rule, however, I do not find this necessary. I change the first clamp-band for a larger one, and make use of another splice or extension-band, placing the bolt on the buccal or lingual side of the other apparatus as may seem proper.

Spreading Device.—I have a useful little spreading device for this class of cases, which I will mention. It is shaped somewhat like the letter H (illustrated in Fig. 8). This is for action upon one tooth at a time. Instead of first using the second molar for anchorage, the second bicuspid is started with a wooden wedge, after which is inserted the device, made as follows: To the ends of a narrow piece of stiff gold plate, about five-eighths of an inch in length, are soldered little strips (thin as paper). To the other extremities are soldered nuts, between which plays a screw, as shown in the triplex-loop (Fig. 5).

Placing the device in position, the nuts are driven apart by the bolt, which moves the second bicuspid back to the molar, when this tooth is bound to it with a clamp-band and allowed to remain, while the spreader is set back behind another tooth, which is forced back against the second bicuspid, and is in turn bound against the other two teeth with a larger clamp-band substituted for the smaller. The only difficulty with this spreader is in making it firm. This end may be attained with a little piece of side plate, fitted so as to ride on the gum and soldered to the spreader, or by fastening to ferrules or to clamp-rings. The same result may be had by soldering it to an extension-arm from the clamp-band. From this larger band, if there is sufficient room, an extension-splice is now added and carried forward around the cuspid, which may be drawn into position without tilting the molar too much.

Fig. 8.



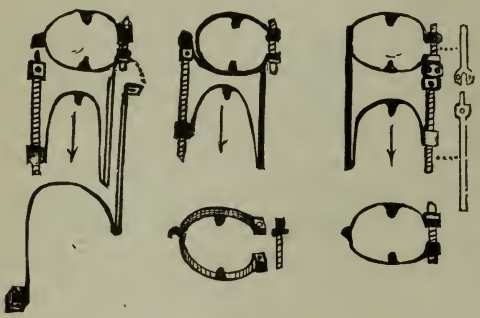
Spreading Device.

Fig. 9 illustrates various modifications of the H spreader attached to clamp-rings.

Fig. 10 illustrates two modifications of the H spreader attached to ferrules set on teeth with phosphate of zinc.

Another little device for preventing this spreader from working out of place I call a gum-guard ring (Fig. 11), described in the Dental Cosmos for July, 1881. This consists simply of a thin band with hook-lugs to hold the device, and a bail which lies in the sulcus of the tooth to prevent it slipping into the gum. Of course the ring must fit the tooth so closely as to require being driven on. A narrower ring set in phosphate of zinc in some cases works well.

Fig. 9.



For rotating teeth, several plans are in vogue. Dr. Guilford suggests a unique device, made of three little pieces of narrow plate soldered together, making something resembling the letter X. (See the Dental Cosmos for November, 1879.) This is designed for rotating central teeth. The cross-point lies between the teeth, while the ends or horns are bent to

Fig. 10.

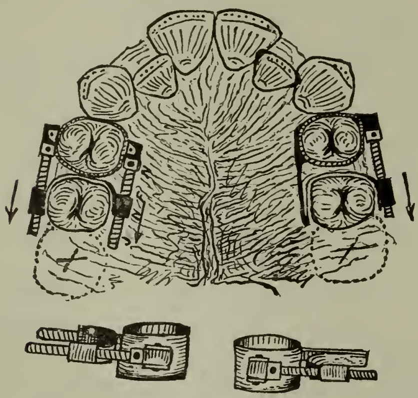


Fig. 11.

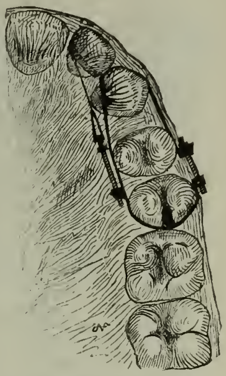
Gum-guard Rings.

bear upon different points of the teeth according to the movements desired.

I have several little devices for rotating teeth that are more complicated and probably no better; therefore I will mention only two or three. Besides the swivel jack-drags (Figs. 12 and 13), there is one

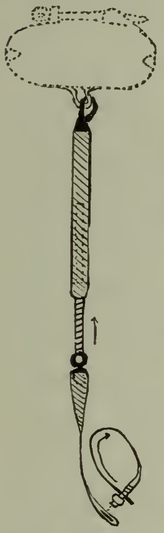
(Fig. 14) somewhat resembling several which have been described in the DENTAL COSMOS. A tongue (T) is cut in the middle portion of a little strip of stiff gold plate (P), and is then bent through and underneath so as to bear upon the tooth to be rotated, by the pressure of a sliding-nut (N) as it creeps along the screw. To adjust this device, first place around the tooth to be rotated a snug little band, set in phosphate of zinc, or otherwise tightened; to which attach, by hook or solder, a little strip of gold, one-sixteenth of an inch in breadth, that may be single or divided midway its length, as shown (Fig. 14), which extends through a hole in the bridge-plate (P). On the ends of each of these ribbons are nuts, which by a screw are made to move apart, drawing upon the band (X), and rotating the tooth. This device is complicated, but made and applied properly it works well.

FIG. 12.



Clamp and Anchor-band with swivel Draught-screw.

FIG. 13.



Swivel Jack-rotator. To use across the mouth.

FIG. 14.

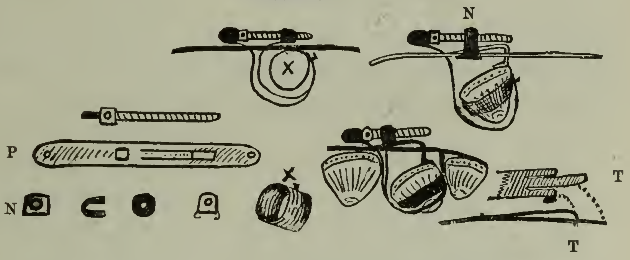
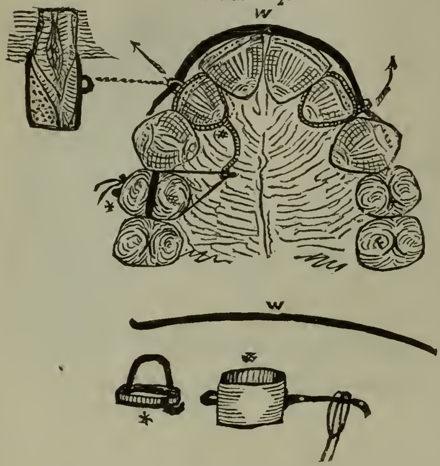


Fig. 14½ illustrates a simple means of drawing forward or for temporarily retaining lateral incisors in position where the mouth is needed for spreading devices; also a simple plan for rotating teeth by a lever wire soldered to a ferrule, set with phosphate of zinc.

Shortening the Dental Arch.—We come now to shortening arches, or drawing in protruded front teeth. In constructing devices for regulating teeth, especially for large operations, five points should be considered: First, *simplicity;* second, *practicability;* third, *painlessness;* fourth, *convenience;* fifth, *cleanliness.* That which is practicable, so far as the mechanism is concerned, may be extremely inconvenient, if not painful. For various operations, including this, Magitot mentions in his work the use of hard-rubber plates, with wooden pegs set in holes. The plate is formed so as to extend around outside of the front teeth, through

which at different points are daily driven more and more the wooden pegs, which impinge against and move the teeth. In place of these wooden pegs Dr. Gaines, of England, has used screws. When and by whom the screw was first used, however, for regulating teeth, I do not know; but, so far as I have been able to ascertain, it lies between Dr. Dwinelle and Dr. Gaines.

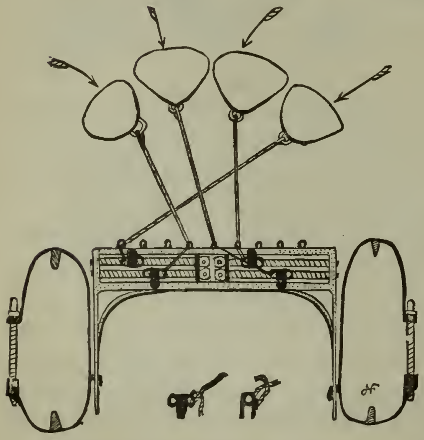
FIG. 14½.



Dr. Crowell. Dr. Dwinelle used jack-screws in 1850. These were the first jack-screws made in this country.

Dr. Farrar. Here is a clipping from Dr. Gaines's little pamphlet, sent to me with no date, mentioning having used screws. I wrote and asked him to send me a dated pamphlet, or proof that he did this thing at the time claimed (1849), but I never received a reply. I will read the descriptive portion of the clipping: "A gold plate extends back to and embraces firmly the first molars. To this support a thick, flat piece of gold is attached, and carried around the front part of the dental circle, so as to cover all the anterior surface of the incisors, leaving only the cutting edges free. This accomplished, I cut away the *plate* from the posterior surface of the irregular teeth, and *opposite* to these vacant parts drill holes in front through the thick gold, into which a screw is inserted for each tooth to be operated upon." Whether the peg-plate explained by Magitot (the picture of which I here show) is of an earlier date, I do not know, but both devices are similar except in the matter of pegs and screws.

FIG. 15.

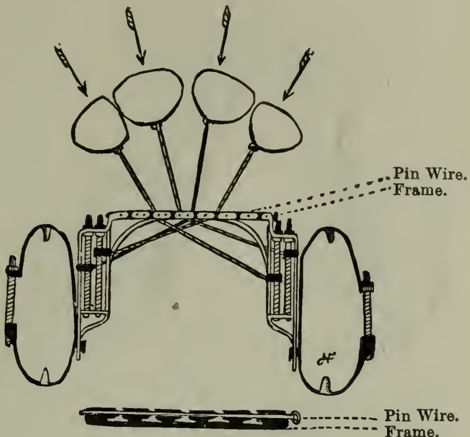


Practicable, but absurdly inconvenient.

Inside Apparatus for Drawing in Protruded Front Teeth.—For illus-

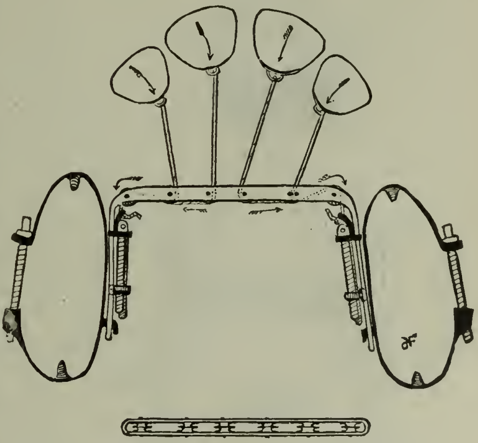
tration by contrast, and to make the value of simplicity stand in bold relief, suppose I sketch a few things that would be very practical so far as power is concerned, but absurd in the matter of comfort and convenience to the patient (Figs. 15, 16, 17, and 18). We will first place around one or two posterior teeth on each side of the mouth an anchor clamp-band, with hooks attached on the lingual side as mentioned in the first operations (Fig. 2). To these hooks attach a strong, metallic, rectangular bar, reaching forward, as illustrated here. Then from little rings fitted around the teeth to be drawn in attach strings or hair-wires, and extend them back through staples or holes in this frame, and fix them to nuts so shaped and fitted to the frames that they will play along screws as shown (Fig. 15). By this plan any degree and direction of movement can be easily attained. But such things as these would be very uncomfortable to wear. They would be cleanly, however, for they are skeletons. As you will readily see, different modifications of this device may be made by having screws in different positions, and if desired, instead of acting independently upon the four teeth, they may be drawn in collectively by a front bar. But to attempt to use such things as these in patients' mouths would be the height of absurdity. Still, in these things there is a lesson that may profit us.

FIG. 16.



Practicable, but inconvenient.

FIG. 17.



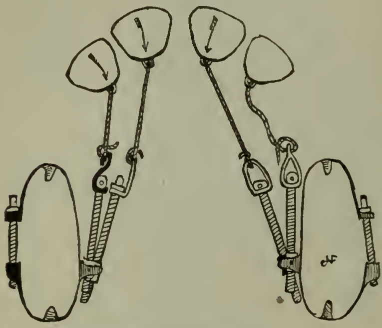
Practicable, but inconvenient.

Dr. S. G. Perry. How would you do it?

Dr. Farrar. Either by an outside apparatus (Fig. 27), or by an

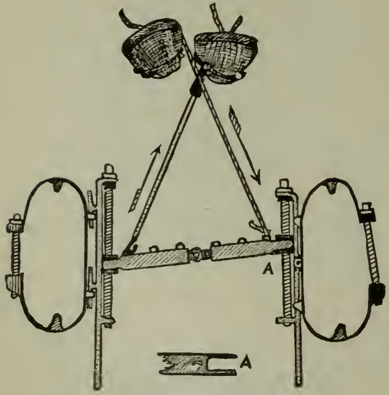
inside apparatus (Figs. 22, 24, 25, and 26). I published in the DENTAL COSMOS for February, 1878, an inside apparatus that was quite practical. Instead of the bow crossing the vault of the mouth in mid-air, I used a narrow swaged piece of plate, which fitted the tissues across the forward part of the mouth a short distance in the rear of the front teeth. This cross-bar was attached by wire (skeleton) to anchor clamp-bands around posterior teeth, similar to the other plans mentioned. Through holes in the cross-piece passed small screws, connected by very thin, flat plates to little rings placed around the teeth to be drawn back. On the opposite side of this cross-bar nuts were placed on the screws (hard rubber was vulcanized to the bar to cover the angular points and prevent irritation). As will be seen, this resembles those devices which I have pronounced absurd, but in practice it has but little of the objections referred to. On the contrary, it is practicable, cleanly, and not very uncomfortable to the patient. These nuts were turned by a right-angle key (Fig. 20), similar to that described in the DENTAL COSMOS for November, 1879.

FIG. 18.



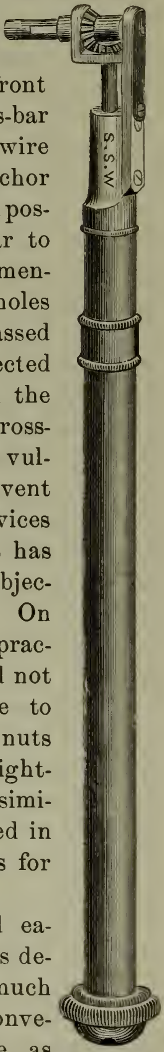
Practicable, but inconvenient.

FIG. 19.



Practicable and useful in some cases.

FIG. 20.

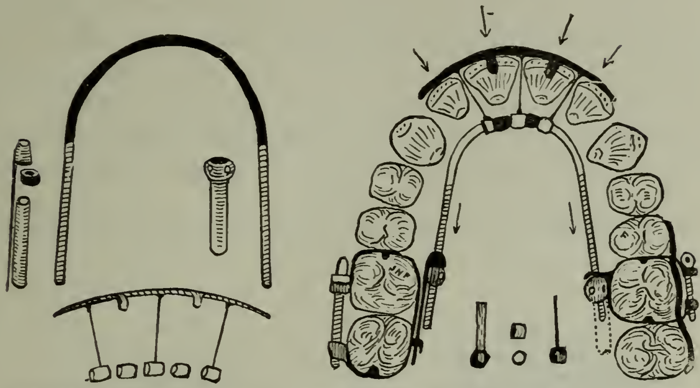


As practical and easily operated as this device is, I now have much better and more convenient forms made as follows: To each anchor clamp-band there is soldered on the lingual side either a smooth staple (Fig. 22) or a hook to fix other parts to. Through or to these anchors are fixed the legs of a small U-shaped wire, threaded about one inch from the ends (Fig. 21). This wire

is bent to lie close to the gum alongside the lingual walls of the bicuspids. There are various other ways this might be attained, but they are objectionable (Fig. 23).

Dr. Charles Miller. What gauge is the wire?

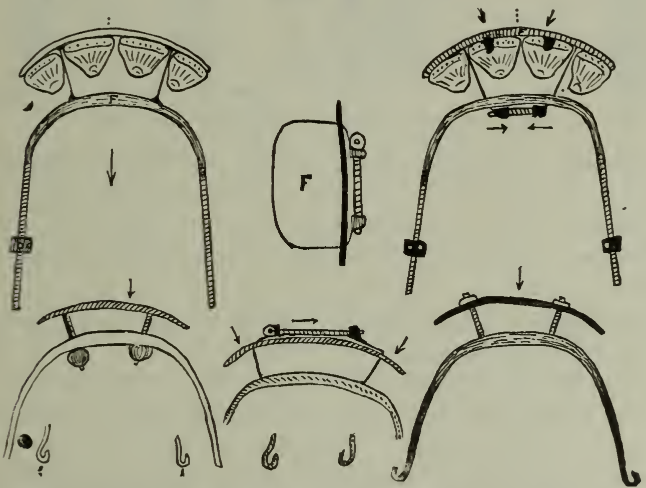
Fig. 21. Fig. 22.



Regulating Apparatus for drawing in protruding Front Teeth collectively by a Cross-bar.

Dr. Farrar. I do not remember the gauge. I judge by my eye entirely. It is about the size of a pin, or a very small knitting-needle. I once spent considerable time in writing a paper (Dental

Fig. 23.



Different modifications of the Drafting Portions of Apparatus for drawing in Teeth.

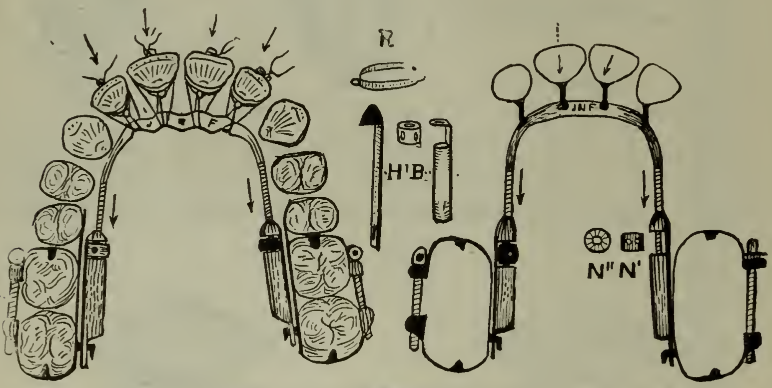
Cosmos for February, 1879) giving a table of all the gauges I use, for public benefit, and a month after I didn't know anything about them. My workman has draw-plates, screw-plates, and gauge-plates, but I indicate sizes by arbitrary names,—as first, second, third

sizes, etc. I suppose, if I should ask any of you gentlemen present the size number of the teeth you used for your last case, not one of you could tell me.

When this apparatus is ready for use and the anchor clamp-bands are in position, the teeth to be moved may be attached by a front bar (Fig. 22), or better by a small individual band, placed around each tooth, and connected independently with the front part of the U drag-wire by a string or wire (Fig. 24). They may also be connected by small flat-rolled wire, by hook, ferrule, or solder, as shown in Figs. 22–25. The legs of the U wire are passed through the smooth anchor staples and held in place by hooded nuts, as shown here (Fig. 21), or by ferrules (Fig. 24).

Fig. 26 illustrates a modification of this and the device described

Fig. 24. Fig. 25.



Regulating Apparatus for drawing in Protruded Front Teeth.

in the Dental Cosmos for February, 1878, for drawing in protruded front teeth.

Dr. Miller. What prevents that wire from bending?

Dr. Farrar. If the wire is very small it should be stiffened in the bow.

Dr. La Roche. What do you do when your arch is full and you have not sufficient room to draw it down?

Dr. Farrar. I am talking about apparatus for cases where there *is* room; not those where the arch is full. Where the arch is packed, unless the contour of the face contra-indicates, we must make room by extraction in order to preserve a proper profile to the face. If I was to have such a lip as that [drawing a diagram of protruding upper lip], and the teeth were packed, I would probably extract one of the bicuspids on each side. There are cases, however, where it would be best to extract the first molar, if badly decayed.

Dr. La Roche. If the arch be expanded, would it not gain that room?

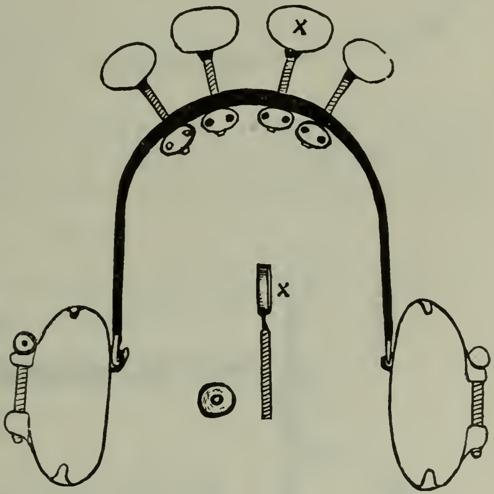
Dr. Farrar. It has been taught that room can be gained by such means, but it is mainly an error. But very little room can be gained by that plan, and where only a little room is necessary it may be best; but in pronounced cases it is impossible to gain sufficient room by simply forcing outward the side teeth. I am not speaking of V-shaped arches.

Dr. Hodson. May I ask how you retain the teeth after you get them in position?

Dr. Farrar. I generally make a little skeleton plate that fits around the labial walls, or a skeleton inside finger-plate. As a general rule, a little skeleton affair that will spring into position will be sufficient.

Outside Apparatus for Drawing in Protruding Teeth.—The outside apparatus for drawing in front teeth consists of two clamp-bands for anchorages fitted around the posterior teeth, to which is attached, by a screw, a long band extending from one anchor-band around the front of the arch to the opposite anchor-band, somewhat like one that I published several years ago (DENTAL COSMOS for June, 1878, Fig. 21), but now somewhat improved (Fig. 27).

FIG. 26.



Dr. Baldwin. In regulating teeth, how often do you turn the nuts?

Dr. Farrar. Generally twice a day. But I do very little of that; the patients do most of it. I tell the patient to tighten the apparatus by turning the screw sufficiently to feel pressure short of causing pain. If they complain that they have caused pain, I tell them that they have turned the screw too much, and that of course they can hasten the process by pushing the operation to pain.

Here in (32) bottles are several of these devices,—some of them my old style, others the new improvements.

[Devices passed around.]

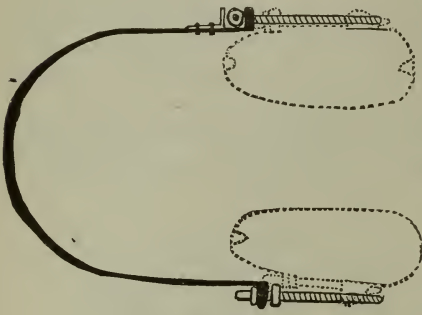
Dr. F. Y. Clark. I would like to ask you whether in moving whole dentures, or the bicuspids and molars of the upper jaw, you pay any attention to the antagonism of the teeth?

Dr. Farrar. Certainly.

Dr. Clark. I cannot see how you can from your description. It is necessary to look out for that; I have been troubled a good deal in that way.

Dr. Farrar. The subject of the evening is mechanical appliances for moving teeth,—the construction of the apparatus *per se*. The question of antagonism is almost enough for an evening's talk, and besides, if relevant, it would be very difficult to talk intelligently upon that point without having cases or casts to show, for the slightest difference in the case makes a world of difference in practice.

Fig. 27.



Moving Undeveloped Teeth.—There is another class of cases which have been considered troublesome. For illustration, where the sixth-year molar and first bicuspid are fully developed and erupted, and the grinding surface of the second bicuspid is in view, yet is level with the gum, and it is desirable to widen the arch without

Fig. 28.

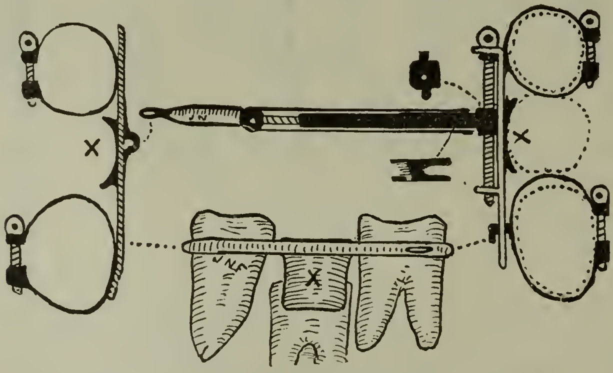


Fig. 29.

Device for moving Undeveloped Teeth while widening the Arch.

waiting for full eruption. This can be accomplished by fitting a little band around the molar, and another around the first bicuspid, after being united by a stiff but narrow piece of plate, the anterior by solder, the posterior by a button, spur, or hook, projecting from the molar band, through an oval hole in the bar, as here shown. (Fig. 28–29.) To this band, midway, is soldered a little dog-ear arched plate (X)

that extends downwards between the free gum and undeveloped teeth (which are never united along the enamel). If the same condition exists opposite, do likewise, and then force the fixtures apart with a jack-screw, as here shown.

Fig. 30.

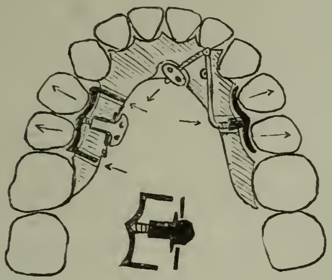
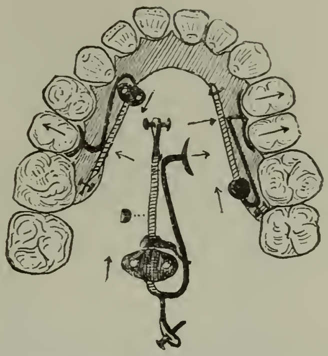


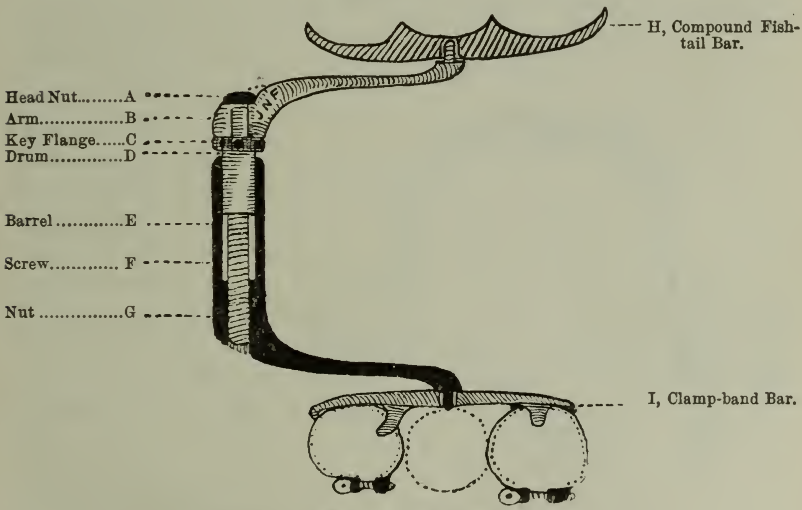
Fig. 31.



Two modifications of Apparatus for Widening the Lower Dental Arch. Practical, but inconvenient. Shown to illustrate by contrast with Figs. 32 and 33.

The question that naturally arises in this connection is, whether the undeveloped root may not become injured by the regulating process. I have never noticed any such trouble.

Fig. 32.

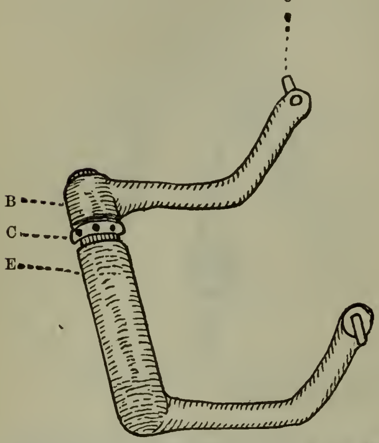


Top sectional view of a Machine for Widening the Lower Arch.

Widening the Lower Arch.—Now, about widening the lower arch. This has been considered a very difficult operation. Dr. Talbot makes very simple and efficient devices. He vulcanizes a horse-shoe shaped

plate, to fit to the inside walls of the dental arch. Through this plate off against the teeth to be moved (outward), he makes a hole, through which the ends of a bent spring wire, extending along the lingual surface of the plate from a coil fastened on a peg in front, pass and impinge against the teeth to be moved. The patient can take it out (to clean) and replace it easily at any time.

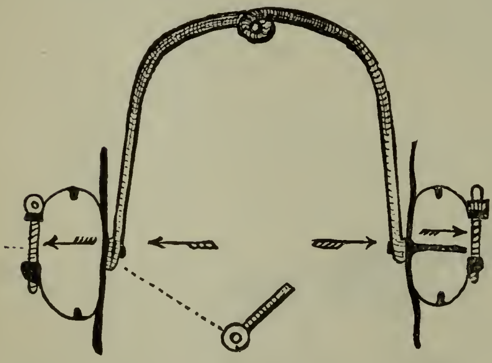
Fig. 33.



External view of a Non-irritating Widening Machine for the Lower Arch.

But these are of the plan for continued force. As you all know, I am partial to intermittent force, under perfect control of the patient. Many plans naturally suggest themselves for this operation. Some are perhaps practicable, but unnecessarily difficult to make or operate. (Figs. 30 and 31.) Should I use a straight jack-screw across the lower arch to attain this intermittent force, it would interfere with the tongue, and the tongue with it. But I have finally succeeded in devising an excellent apparatus (Fig. 32) made as follows: Around the side teeth are fastened clamp-bands (I), or if desired compound fish-tail bearings (H), having a small hole (or pivot if desired) through the middle portion. In this hole rests a loose pivot (J, Fig. 33), extending from a steel arm of the apparatus. This arm extends downward and forward around under the tongue like a bail (Fig. 34), or it may constitute a portion of a non-irritating jack-screw, (see the Dental Cosmos for August, 1882), which unites with its mate under the anterior portion of the tongue (Fig. 33).

Fig. 34.



All that is necessary in operating this is to raise the spreader like a bail of a pail; turn the screw with a right-angle lever-key in holes

in the screw flange (C), and then let it drop down under the tongue again, where it will be out of the way while eating, talking, or singing. This is a very simple device to work, and charming in its effects.

Fig. 34 illustrates a less expensive bail spreader, but it acts upon the plan of continued pressure.

The devising of a practicable yet simple apparatus for widening the lower arch by intermittent force was the most difficult puzzle in this line that I ever attempted to solve, but I feel that it has been accomplished. Of course it may be considered a modification of the jack; but it is so different in general outline and construction, so practical in its action, and overcomes so many difficulties impossible to be met by the old-fashioned straight jack, which under no circumstances could be used here, that it may be said to be new and unique.

The society held a regular meeting, Tuesday evening, December 1, 1885, in the rooms of The S. S. White Dental Mfg. Co., Broadway and Thirty-second street.

The president, Dr. William Carr, in the chair.

Dr. C. F. W. Bödecker, chairman of the Clinic Committee, reported as follows:

Mr. President and Gentlemen: The attendance at the clinic today has been rather small, only about forty persons being present. Dr. J. C. Nisley filled a left upper first bicuspid, in the mesial and grinding surfaces, with Quarter-century gold foil, using about five sheets of gold. The operation was performed without applying the rubber dam, and was completed, I believe, in a very short time. It was finished before I arrived, which was nearly three o'clock. Dr. H. H. Sisson presented a child having an extensive irregularity, principally of the upper jaw. There was also presented a model of a case of irregularity,—the irregularity consisting in the protrusion of the lower jaw. I expected a gentleman to exhibit a new gas motor which has lately been patented, and which I think will prove to be of great benefit to the dental profession. I have designed an attachment by which we can reverse the action of the motor, and accelerate or lessen the speed, and stop it immediately. This motor I hope will be shown at some future clinic. I exhibited some finishing appliances, for which I am indebted to Dr. Herbst, of Bremen; Dr. Berggren, of Stockholm; and Dr. Forberg, of Stockholm. You know that the small corundum-wheels, made of corundum and shellac, wear out very quickly,—especially the very small ones. To make more durable corundum-points Dr. Herbst experimented

quite extensively. He takes two parts of corundum or emery and kneads it into one part of red rubber. I have tried this, and find it a rather difficult thing to do. While kneading the corundum into the rubber, the latter has to be made quite warm, yet not hot enough to vulcanize the rubber. Then ordinary button-molds, to be obtained in any fancy-goods store, are mounted upon an old, worn-out bur, and with the head upwards, put in plaster. When the plaster is hard the button-molds are removed; the mandrel thoroughly cleaned; a piece of ordinary red rubber applied around the mandrel, and the rest of the space filled out with the rubber impregnated with corundum or emery; the flask closed, and vulcanized in the usual manner. When they are taken out they are finished upon a coarse file; the mandrel is coated with wax and thrown into nitric acid. The nitric acid dissolves away the rubber, thus leaving the corundum free; therefore these points will cut equal to a very sharp steel bur, and last very much longer. Soft-rubber points may be made of ordinary velum (soft) rubber. This velum-rubber may be impregnated easily with very fine corundum, or pumice-stone, and in this manner it will work beautifully in polishing or cleaning teeth. But the soft-rubber wheels, as we get them, do not last long, and in order to overcome this difficulty a hard-rubber center is put into the soft-rubber wheels in the following way: The center of a piece of soft rubber is punched out, and a piece of hard rubber substituted for it. It is then enveloped in tin-foil, and thrown into a flask and vulcanized in the usual manner. This combination of hard and soft rubber makes a more serviceable polishing-wheel than soft rubber alone. Disks of rubber-cloth have been prepared, but rubber alone is rather flabby, and does not work very nicely. To make them more effective the rubber is given a thick coating of shellac; then put under a press for three or four days, and the disks are stamped out. When the rubber has been treated in that way the disks will be found very stiff and to work very nicely in polishing. If you require thinner disks, very thin rubber-cloth can be manipulated in the same manner, and quite thin yet serviceable disks can be produced. Strips made of this rubber can also be used with advantage for polishing the approximal surfaces of the teeth. Strips of leather, which heretofore have not been found very useful, may be used with great advantage by sewing a seam in the middle, which will prevent the leather from curling up or stretching out. Very fine velvet braid has also been found to polish exceedingly well. To make a very serviceable linen tape, we proceed in the following manner: Take some thin linen tape, immerse it in a thin rubber cement for one day; then take it out and remove all the superfluous cement; hang it up for twenty-four hours, and impregnate with pumice-stone,

fine corundum, emery, or anything of that sort. The polishing material finds its way into the fiber of the tape, and will adhere as long as the tape itself lasts. Disks of thin linen and sand may be prepared very easily by taking a piece of linen and a piece of sand-paper of corresponding size, and varnishing both the paper (on the sanded side) and the linen; then putting them under a press for two or three days. After taking it out let it dry for a day in the open air, and then throw it into water. After a little while the paper will separate from the linen, leaving the shellac and the sand upon the linen. This makes a very nice disk. Very thin disks can be made of card-board by treating it to a thick coating of shellac, and distributing over it some corundum, or other similar material, and allowing it to dry for two or three days. These disks will not be affected immediately by the saliva, and will work very much better than the ordinary sand-paper and emery-paper disks. Watch-spring saws may be covered while hot with a coating of hard shellac and (while they are hot) thrown into emery or corundum. They are very useful for working between the approximal surfaces of teeth in removing surplus filling material, and will stand better than a thin file or the strips that have been heretofore used.

Incidents of Office Practice.

Dr. W. H. Dwinelle. I learned that the question of the priority of the use of steel jack-screws for regulating teeth came up at our last regular meeting. Unfortunately, I was called away from that meeting early in the evening, or I would have answered the question then. Some time about the year 1845—I will not be positive as to the year—a circumstance occurred which developed to me the use of the steel jack-screw in the mouth in a way that I will now relate. At the time I speak of I had occasion to go with my preceptor, Dr. Jehiel Stearnes, of Pompey Hill, in this State, to amputate a man's leg in the hay-field. An old set of English instruments was used, the amputating blade of which was a particularly large one. After the operation was performed the box containing the instruments could not be found. A search was instituted for it, but to no purpose. The next season, when it was found, the vicissitudes of climate, snow, rain, sunshine, and storm had made sad havoc with the box; the glue had melted, the coverings were separated, and it was a general wreck. All the instruments save one were found to be exceedingly corroded with rust and were utterly ruined; but, to my surprise and the surprise of everyone, the amputating instrument blade, although it had separated from its wood and the hasp from the handle, was not rusted at all, and scarcely more than dimmed. On examining it closely I noticed that at the end of the hasp there

was an irregular deposit, apparently of some foreign metal. By more careful examination and tests I ascertained that it was zinc. The whole mystery was then explained,—the presence and contact of zinc with the steel had induced galvanic action, which prevented its rusting, and the blade had thereby been preserved. Somebody before me had discovered that principle, so I lay no claim to that discovery. The effect of zinc upon this blade instantly suggested to me, as it would to the minds of you all, that steel instruments of any form or character could be used in the mouth with impunity by simply associating zinc with them or attaching it to them. Now, what is the most valuable and powerful instrument known to mechanics? Why, the jack-screw. And the steel jack-screw suggested itself to me. Within a few hours I had made several of them of different sizes, from one-quarter of an inch to two inches long. Some of them I have with me now. I made these jack-screws of different forms, and with different points and angles, adapted to different purposes and cases, and in one side or end I drilled a small hole, which I loaded with zinc. So long as the zinc remains there (it will waste away in time and need refilling) the instrument will not rust. At that time jack-screws made of gold, silver, or other precious metals may have been used in the mouth; but they were comparatively impracticable, because they had to be made so large to insure strength that they defeated their own purpose. No jack-screw made of steel alone could have been used in the mouth prior to that time, because it would necessarily have rusted. Therefore I claim to have originated the use of the steel jack-screws in dental operations, and it does not matter whether it was in 1845, 1865, or 1875 that I made this discovery; they could not have been used for that purpose before that event. It is true that you see jack-screws made to-day that are not loaded with zinc, but they are coated with another metal (nickel), which answers in a very large degree the same purpose, but not fully.

Before sitting down, gentlemen, I feel as though I wanted to raise my feeble voice to warn our profession generally in reference to the indiscriminate, careless, or thoughtless use of cocaïne. The anesthetic qualities of the hydrate of cocaïne have been discovered within a few months. It is a new agent in that respect, and yet we are employing it as though we had an experience of many years in its use. In the same way chloroform, when it was first introduced to our profession, was indiscriminately and injudiciously used. Now we rarely use it. I think we should employ cocaïne with great caution. There was reported in the newspapers the case of a man who had become absolutely insane, and his entire family ruined in health, from the excessive use of cocaïne. We have had some re-

markable and even dangerous experience with it here in our own midst. I should as a rule condemn its use hypodermically, especially when brought in contact with the nerves themselves.

Dr. F. Y. Clark. I have seen several newspaper articles condemnatory of cocaïne. As many of you are perhaps aware, I was one of the first manufacturers of cocaïne in this city. I have no financial or mercenary interest in it now, but I have used it and am using it extensively. I have been anxious to learn of any well-authenticated case where it has acted adversely or proved injurious under judicious use. I have employed cocaïne in over five hundred cases, I think, altogether, and I have found that wherever it is used as a local application to the mucous membrane with due care it is perfectly safe. As to these articles in the papers, my knowledge of the manufacture of cocaïne convinces me that it cannot be manufactured in this country at a less cost than seven cents a grain. The leaves are now selling for sixty cents a pound. These articles, to which reference has been made, appeared in the papers about two weeks ago, and from that time cocaïne went down in price, until it is now four cents a grain. It has been bought up not only in New York and Chicago, but in every State on this continent, so that you can hardly get a pound of it now, and you will find, I think, in less than three weeks that you cannot buy it for seventy-five cents a grain. I think that in these facts we may find an explanation of the newspaper articles. I have interviewed many physicians as well as dentists in regard to the effects of cocaïne, and the testimony is all one way; and, so far as my experience and investigations have gone, the verdict must be that it is safe and harmless when judiciously used. If there is any authentic case where it has proved injurious when carefully and judiciously used, I should like to know of it. It is a common thing among the soldiers of Peru and Guatemala to carry, when on the march, a little bag of coca leaves, which, in case they are wounded, they chew in the mouth and apply to the wound. That has been their custom for over one hundred years. The leaves act as an antiseptic. In Guatemala, Peru, and other South American States, coca leaves are chewed as commonly as tobacco is chewed in the South, and we have yet to hear of its bad effects. I think this whole thing is gotten up to make a "corner" in cocaïne.

Professor E. T. Darby, of Philadelphia, then read a paper entitled "Erosion of Enamel, and Etiology of Labial and Buccal Caries."*

* The substance of this paper was embodied in one read before the Odontological Society of Pennsylvania, and published in the DENTAL COSMOS for April, 1884. The discussion which follows will be better understood by reference thereto.

Discussion.

President Carr. Gentlemen, the subject is now before you for discussion. Dr. Dwinelle, can you not solve the riddle, or help to do it?

Dr. Dwinelle. I think, notwithstanding the excellent paper we have been favored with to-night, that the problem is yet unsolved. The essayist has given us a variety of hints, by which we shall no doubt profit more or less, but stultifies us in our inquiries by giving us examples that are so diverse and contradictory in themselves that, after listening to his exposition, we feel that the riddle is still before us. A subject that has occupied the attention of so many of our profession for such a length of time is one that I, of course, cannot satisfactorily explain. I can do no more than to throw out some hints, as the author of the paper has done. I remember an incident very peculiar and interesting. A number of years ago a gentleman came to my chair who had not been there for several years. I was surprised to find his teeth badly wasted and eroded at the cervical edge near the gum, where the enamel loses itself in the cementum, and grooved out as though they were cut with a file and afterwards polished. This had all taken place within a year or two, and the absorption had proceeded so far as to expose the pulp in several instances. I told the gentleman I believed he was under the constitutional effects of the iodide of potassium. He admitted that he was literally saturated with that salt, which he had resorted to for the purpose of curing a very unfortunate affection of the eyes. Dr. A. J. Watts, whose name is familiar to us all, and to whom the profession is largely indebted, was at that time a student of medicine as well as of dentistry and metallurgy, and happened to be in my front office at the time. He was, as some of you may know, quite deaf, and it was impossible for him to have heard our conversation, being three rooms off. I called him in and introduced him to my patient, showed him the unfortunate condition of his teeth, and asked for an opinion. After examining the case critically he said, "I don't know, but his teeth have the appearance of one whose system is saturated with iodide of potassium." It was a remarkable circumstance, and there is a useful hint to be derived from it. Then the question of absorption came up; and I am accustomed now to speak of an expression of this kind as absorption of the teeth. We know that iodide of potassium, more perhaps than any other medicinal agent, has a direct influence upon the absorbents of the system, generally stimulating them to action; if so, why not upon the teeth? We are but chemical laboratories walking about on stilts, so to speak, containing as we do all the chemical elements, and our chemistry is constantly changing; the saliva being at one

time alkaline, at another time acid, and again exceedingly salt. So with the rest of the fluids of the system. The perspiration is constantly changing its chemical character; at one time we can scrape cubes of salt from our foreheads, while at other times the secretions are so strongly acid as to produce decided reaction upon litmus-paper. We can but speculate upon these things, and it seems reasonable to attribute this destruction to the chemical and constitutional changes that are taking place. We certainly know that in cases of this kind there is a deficiency of lime, which fact suggests alkaline treatment. I once dismissed a lady from my chair with her teeth in perfect order. She went to Europe, and four months after returned to me with her superior incisors eroded in such a peculiar manner that I was both surprised and interested. The teeth appeared as if covered with hieroglyphics, like the Obelisk in our Central Park, and were grooved very nearly through the enamel, deep and sharp cut. I treated the patient constitutionally with lime, and had her pack the teeth with pastes of phosphate and carbonate of lime each night alternately on going to bed. The constitutional treatment I prescribed was Fellows's hypophosphites and lime-water. I accounted for the erosion in this case from the fact that my patient had been in the habit of eating or sucking lemons, bringing them in direct contact with the teeth, through the advice of some one who told her that if she ate lemons it would prolong life, or something to that effect. I have no doubt that in this instance this habit was the cause of the trouble. I continued the treatment, constitutional and local, for about a year; had her discontinue the use of lemons, and regulate her diet so that it was alkaline in character, until I entirely arrested the destructive process, and finally polished off the teeth, reducing the enamel to extreme thinness. After nearly three years there has been no recurrence of the abrasion, and with proper care on her part I do not think it will occur again. I have had several "lemon cases" since, all of which I have treated with entire success in the manner above described.

Dr. C. E. Francis. The worst case of erosion of the enamel that I ever saw was that of a young lady, an invalid who was unable to stand on her feet, and who had been confined to her bed for a number of years. She had been dosed with bromide of potash and iodide of potash to such an extent that her stomach seemed to have lost its tenacity. The fluids of the mouth appeared to be very acidulated, and her teeth were almost entirely deprived of their coating of enamel. It was so interesting a case that I invited Dr. Northrop and another dentist to call and see it. I presume the loss of enamel was the result of taking too much of this saline medicine.

Dr. Bödecker. Mr. President and gentlemen, I have to thank Dr. Darby for his excellent paper. It is a subject which has individually interested me more or less for the last three or four years, practically as well as scientifically; practically as it concerns my own mouth, and scientifically because it is of great importance to the profession. At a meeting of the New York Odontological Society Dr. J. Morgan Howe suggested that the living matter of the teeth might have something to do with the process of absorption or erosion, which remark induced me to study this class of teeth under the microscope. I examined them expecting to find the secret, but up to this time I have, I am sorry to say, found very little that throws much light upon the subject. All the teeth at my disposal at that time I have ground. One of these I prepared in such a manner that the polished (eroded) surfaces can be examined directly. I could not observe, with high magnifying powers, an exposed dentinal fiber nor perfectly open dentinal canaliculus. This observation was verified in longitudinal sections. There certainly appears to be some reaction in the dentinal fibers; but whether that was produced merely by the erodent (tooth-brush, acids, or bacteria), or whether the living matter has anything to do with it, I am as yet unable to say. With regard to the practical part of this paper, I can indorse almost everything that Dr. Darby has stated; and, in fact, one of the cases occurred in my own mouth. I very carefully observed the condition of my mouth from that time. This occurred four or five years ago, when my system was very much run down. I was at that time very nervous and exhausted. Although my saliva never was decidedly acid, my two central incisors kept wasting away at a rapid rate,—so much so that, within about a year and a half, the enamel of the labial surface of those two teeth was almost entirely gone. After that time the wasting process stopped. It has occurred to no other teeth except these two. I have used all the remedies that Dr. Darby speaks of, as well as those mentioned by Dr. Dwinelle. I have used chalk every night to counteract acids, and have sometimes, when I could not sleep at night, gotten up and applied litmus-paper under my tongue in order to see if the mucous secretions were decidedly acid, but I never have found a decided acid condition in my mouth. I tried red litmus-paper to ascertain whether there was any over-alkalinity of the saliva, but without any effect whatever. Those two teeth are not so sensitive as they were, and the erosion seems to go no further. The remedy which gave me most relief is the galvanic cautery. That may have stopped the destructive action to a certain degree; although I should have thought that if the cause was an acid—which I did not detect—it would have made some marks upon the other teeth in the mouth; but none of the others have been affected.

Dr. Clark. I wish to ask Dr. Darby a question which I think has a very important bearing upon the subject. You all know that it is a mooted question with many of us as to whether this peculiar action is found upon devitalized teeth. At one of our meetings some time ago, a gentleman affirmed that it was never known to take place upon devitalized teeth. At that time I stated that I had seen two or three cases of devitalized teeth where erosion was perfectly apparent. I would like to ask Dr. Darby whether I understood correctly that he stated in his paper that this erosion did take place upon devitalized teeth.

Dr. Darby. I have seen it upon devitalized teeth, but whether the erosion occurred before the devitalization of the pulps or after I could not state positively.

Dr. Clark. I have seen in my practice cases of erosion of devitalized teeth. Of course, such cases are not amenable to constitutional treatment. If it can be positively proved that this erosion takes place upon devitalized teeth, then constitutional treatment is, of course, of no value.

Dr. J. W. Clowes. Mr. President, I do not know that any bigger subject than this could come before the dental profession. It stands out head and shoulders above everything else that we have to deal with. When I first thought of becoming a dentist, and when I was pursuing my studies, I used to hear of the denuding process, by which the enamel would be wasted away,—generally from the front teeth; and that was all they had to say about it,—that it was a denuding process; and that was all they knew about it. In those days, and for many years after, wherever we saw a decay it was what we call a good old-fashioned black or brown decay; it was not this peculiar white decay that we see in the mouth now, which is destroying our teeth in every direction, and which makes us feel that here is an enemy that is too much for us and that defies all our skill. What is the cause of that new kind of decay? You say it is a riddle. It is no riddle. If you will only open your eyes you can see it without ever looking for it. In health the condition of the saliva of the mouth is one of equilibrium; it has neither an excess of acids nor an excess of alkali. Teeth under these circumstances will not decay. But let your patient get into the hands of a physician and he will give him some tincture of iron, and then you will see the effect of it in this white decay. A set of teeth will melt away in the course of a year; and gentlemen ask us to solve that riddle. Is there any riddle about that? It is so easy to see this enemy that if you look you can fairly see it creep up over the teeth. Then these physicians will give the patient lime and potash, and in that they are going in the same direction, for an alkali will eat away

teeth as well as an acid. Physicians have got in the habit of giving these drugs, and what is to save us? These things are too much for us to overcome. Can we not make some impression upon our brethren of the medical profession, and get them to hold back in the giving of these medicines? If we cannot we might as well wind up our business. These chemicals will eat up the teeth much easier and more surely than we can save them. A few years ago, when these medicines were not given to such an extent as they are now (I do not know that they were given at all), it was a rare thing to see any other kind of cavity except the black one, but when the physicians began to give these medicines in such quantities then this white decay appeared and multiplied. We are a great society, with much power and influence, and we ought to wake up and say this thing must not go on. When I saw one of my patients to-day with her teeth in this condition, I said she had been taking iron. "Yes," she said, "I have been taking iron." I said, "Tell your doctor what it is doing to your teeth." She said she had spoken to him and he said, "Oh, yes; I know the tincture of iron destroys the teeth; but if it is necessary in order that your life should be preserved, never mind the teeth; let them be eaten up." Now, I say that a medicine that will destroy one part of you while it pretends to save the other part is not a good medicine, and should be avoided as an enemy. The physicians do not intend to injure their patients and ours; they do not realize what they are doing, and it is our duty to try to make them understand it. Let us beg them to stop it. Gentlemen talk about a riddle! There is no riddle here. It is as plain as the nose on your face. Every one of you who knows anything about chemistry would know all about it if you would only think. It is a most discouraging thing to see a set of teeth that I have cultivated for many years, and brought up to be regular, perfect, and beautiful, come back to me after a short interval riddled right and left, and going to destruction in spite of all I can do. This is spoken of as a mystery. Is it a mystery? Let your physician give you some tincture of iron, or some of the powerful potash medicines. These agents lodge upon the teeth, and the chemical affinity between them and the teeth at once sets up a disintegration of the enamel. Then you brush your teeth, and in their softened state the brush will wear them away. I have some specimens in my office that show exactly what we see in the mouth. All the enamel is softened so that you can push it off with your nail or a tooth-pick. It is so plain that I am surprised that gentlemen see any mystery about it.

Dr. W. T. La Roche. The best thing I have ever found to stop this erosion is to thoroughly polish the eroded surfaces. I think Dr. Dwinelle has mentioned the same treatment.

Dr. C. E. Francis. You find them pretty well polished sometimes.

Dr. La Roche. Do it over again, and help it along.

Dr. Frank Abbott. For many years, and until quite recently, this problem was very nearly settled in my mind. During the past year, however, in studying the pathology of enamel, I have discovered what seems to me a predisposing cause, which may assist somewhat in explaining more satisfactorily this as well as other heretofore unaccountable losses of tooth-structure. While I am still of the opinion that the softening influence of acids and the friction of the tooth-brush with dentifrices have the greater part to do with it, I am fully convinced that other factors are present. These are congenital defects in the enamel, which admit of its being acted upon in certain places more readily than in others. A careful observation and study of these cases of erosion will, I think, determine that the surface of the enamel is imperfect in places, and very much softer in those places than others. Is it not, therefore, a reasonable inference that the ever-present acid and the application of the brush and dentifrice would more readily affect and abrade these particular places than other parts of the teeth? I have had occasion to study this erosion in my own mouth, somewhat as Dr. Bödecker has in his; all my six upper front teeth being more or less affected. The upper third of these teeth had little transverse hollows and ridges in the enamel, every one of which, if examined under the microscope, would, I have no doubt, show congenital imperfections in tooth-structure. These imperfectly calcified places being acted upon more readily by acids, as well as by the friction of brush and dentifrice, than the perfectly calcified ridges, accounts for the enamel disappearing unevenly from the teeth.

Dr. F. M. Odell. Mr. President, with reference to Dr. Abbott's theory that the action of the tooth-brush deepens the natural depressions in the teeth and cuts them away so readily, I have to say that his remarks upon that point simply imply that he has not paid any attention to the latest invention of the age, the prophylactic tooth-brush, and the proper way to use it. If he had used that brush according to the directions given, with a rotary movement, by rotation of the muscles of the wrist, brushing the upper teeth from the gum downward and the lower teeth from the gum upward, he could not have cut into these ridges by any possibility; therefore, abrasion in that way would have been out of the question. One question of Dr. Darby. He stated that both of the patients were perfectly healthy persons. I wish to know whether he means they are generally healthy, or perfectly healthy, as he said. Are either of them affected with gout or rheumatism?

Dr. Darby. That is a very pertinent inquiry. I should have

mentioned that I questioned both of them with special reference to gout, as it has been said that a gouty diathesis is connected with this trouble. They both denied ever having had gout or rheumatism. They enjoyed excellent health at that time, and have not been under the treatment of a physician at any time in their lives.

Dr. Bödecker. Dr. Abbott suggested that these eroded teeth may have been imperfectly formed, or their enamel imperfectly calcified. I have given a great deal of attention to that particular point in my examinations of these specimens under the microscope, but the enamel in every one of those teeth showed a perfect formation; so I am sure that, in the instances I have examined, the trouble was not induced by imperfect structure of the enamel.

Dr. J. F. P. Hodson. Mr. President, I was about to follow Dr. Abbott with two cases that occurred to my mind, and which are in direct contravention of the remarks he made. One of them was a lateral and was very deeply cut, presenting the appearance of a sharp file cutting near the gum, and very highly polished. This tooth stood so far in from the adjoining cuspid and the central that it could not possibly have been touched by the brush so as to carry away any of its lime-salts. The central and the cuspid on each side of this lateral were quite perfect and uninjured at that point, the cervical margin of the gum. The other case was that of a gentleman whose central incisors on the labial surfaces were very irregularly eroded, and very deeply,—so much so that I was obliged to fill them. I filled them with platinum and gold, which about that time was coming into use and was thought to be a great improvement over gold. The gentleman lived in Japan. I saw him the next year after I filled these labial surfaces, and he was very much exercised over their appearance; his friends, he said, called them his tin teeth. I told him I would remove the platinum and gold, and substitute gold. When I came to do that I found that the edges of the teeth or cavities at the filling line, at the top and bottom, but not on each side, were very deeply and sharply eroded again, and the filling stood out beyond the tooth, so that brushing could not possibly have done that. I have some of this erosion in my own mouth, as Drs. Bödecker and Abbott have. I think it is congenital. It is of the sensitive sort, and has given me a great deal of trouble at the times of the year when I eat acid fruits. I always eat fruits at breakfast, and when eating either oranges or strawberries I have a good deal of trouble. It is a continual source of irritation and worriment, and often wakes me up nights. I have applied chalk to keep down the sensitiveness of these teeth. I have suggested to my patients that they apply chalk to the eroded surfaces when retiring at night, and they get a great deal of comfort from it in keeping

down the sensitiveness. I have never expected by any means to stop the erosion. I am obliged to see it go on, and when it becomes necessary I fill the teeth with gold.

Dr. Odell. About eleven years ago I treated this condition in the mouth of a gentleman (the teeth being of the densest sort) simply by the ordinary mechanical method of filling. I have seen the teeth within ten days, and there is not the slightest appearance of a recurrence of the erosion. The gentleman was sixty-three or sixty-four years of age. I believe that many of these cases are amenable to treatment with gold; where the texture of the teeth is good, gold is undoubtedly the best treatment.

Dr. Atkinson. I rise to move a very cordial vote of thanks to Professor Darby for the pains he has taken in preparing this excellent paper on a very much disputed question, and for spending his time in coming here to read it before us.

Dr. Atkinson's motion was carried.

Adjourned. B. C. Nash, D.D.S., *Secretary.*

At the regular meeting of the society, held February 2, 1886, the committee appointed at a previous meeting, consisting of Drs. J. F. P. Hodson, W. H. Atkinson, and Charles E. Francis, reported resolutions, which were unanimously adopted, in commemoration of the late Dr. Sanford C. Barnum. The resolutions recognized him as an honored associate, and one whose name should be mentioned with gratitude by dentists the world over. Hearty recognition was accorded to his modest worth; his kindly, generous nature; his brave battle with misfortune and affliction, and to his patient endurance of sickness and pain. A like hearty recognition was accorded to the fact that the introduction of the rubber dam made possible and easy of accomplishment operations with gold which had previously been possible only with practitioners of transcendent skill, and thus at once and rapidly advanced the quality of dental service throughout the world.

KANSAS STATE DENTAL ASSOCIATION.

The fifteenth annual meeting of the Kansas State Dental Association will convene at Topeka, on Tuesday, May 4, 1886, the sessions continuing three days.

This meeting will be made the most interesting and profitable one in the history of the association. Members of the profession in other States are cordially invited to be present. Topeka is easy of access and has excellent hotel accommodations.

C. B. Reed, *Secretary*, Topeka, Kan.

ALABAMA DENTAL ASSOCIATION.

The next annual meeting of the Alabama Dental Association will be held in Montgomery, Ala., on the second Tuesday in April (13th), 1886, commencing at 10 A.M., the sessions to continue for four days.

T. M. Allen, D.D.S., *Secretary*, Eufaula, Ala.

MICHIGAN DENTAL ASSOCIATION.

The thirty-first annual meeting of the Michigan Dental Association will convene in the city of Ann Arbor, Mich., on Tuesday, March 16, 1886; its sessions to continue for four days.

J. B. McGregor, *Secretary*, Port Huron, Mich.

VERMONT STATE BOARD OF DENTAL EXAMINERS.

The Vermont State Board of Dental Examiners will hold their fourth annual meeting at Town's Hotel, Bellows Falls, Vt., on Wednesday, March 17, 1886, at 2 P.M.

Applicants for license are requested to report promptly at that time. See Section 6 of an act regulating the practice of dentistry in the State of Vermont.

R. M. Chase, *Secretary*, Bethel, Vt.

WISCONSIN STATE BOARD OF DENTAL EXAMINERS.

The Wisconsin State Board of Dental Examiners will meet in special session, at Eau Claire, Wis., on Tuesday, April 6, 1886.

Edgar Palmer, *Secretary*, La Crosse, Wis.

EDITORIAL.

THE INTERNATIONAL MEDICAL CONGRESS.

We give herewith a communication from Dr. J. Taft, president of the Section on Dental and Oral Surgery, and an editorial from the *Journal of the American Medical Association.* These fairly present the situation from the stand-point of the writers, and deserve the careful consideration of the physicians and dentists of the United States.

We copy also, because embodying the salient features of the situation as viewed by our English contemporary, an editorial from the *Journal of the British Dental Association.*

To these several presentations, which we publish without indorsement or criticism, there seems little to be added except to repeat the expression of regret that so important a matter should be longer left in such an unsettled condition.

Apart from the statements of Dr. Taft and the *Journal of the American Medical Association*, we see no evidences of the general coöperation necessary to make a pronounced success either of the Congress as a whole or of the Dental Section as a part.

We repeat that the profession in the United States owes it to itself, to the gentlemen who have accepted position in the organization, as well as to practitioners in other countries, to promptly and definitely settle and announce the part which it proposes to take. Simple inaction is neither dignified, respectful, nor fraternal.

If, as is asserted, the "indications favorable for a full European attendance are daily increasing," and thus the success of the Congress as a whole is made probable, there should be no uncertainty about the status of the Dental Section. There is yet time (but not much to spare) for such concerted action as would insure gratifying results. A persistence for a short time longer in the masterly inactivity thus far displayed can result only in failure and mortification.

[*Dr. Taft's Communication.*]

To the Editor of the Dental Cosmos:

Dear Sir: As there seems to be misapprehension in the minds of some, and earnest inquiry by others, as to the status of the Section on Dental and Oral Surgery in the International Medical Congress, to be held in Washington, D. C., in 1887, it seems right and proper that some statement be now made in regard to the organization and progress of the work.

It is very generally known that the Section has been established and organized. The following officers have been appointed, viz., a president, one vice-president, and two secretaries.

Fourteen gentlemen of recognized ability and high professional standing, from various parts of the country, have accepted position upon the Council, and have pledged themselves to do all they can to make this Section a success. At the next meeting of the executive committee ten or twelve more names will be added to the Council, as may seem best. Much of the preliminary work in arranging the matters of the Section has been in the main accomplished.

A programme, embracing the subjects of greatest interest to the profession of the world, has been outlined and is now under consideration, and as soon as completed the secretaries will open correspondence with the eminent men of the profession in Europe and America relative to the work to be done. Quite a number have already indicated a desire to prepare papers, or at least take some part in the work.

We not only expect but are assured that this Section will receive the hearty support and coöperation of dental specialists, both at home and abroad; and with such manifestations great hope is entertained that the Section will be eminently successful. We ask for it the coöperation of all who have the best interests of our profession at heart.

A circular will ere long be issued by the executive committee giving the status of the preparatory work for the Congress.

J. Taft, of the Section.

[*From the Journal of the American Medical Association, January* 9, 1886.]

NINTH INTERNATIONAL MEDICAL CONGRESS—PROGRESS OF ORGANIZATION. —Two or three of our exchanges still repeat the assertion that no material progress has yet been made in the organization of the Congress. This is far from being true. On the contrary, the preliminary organization is at this time nearly complete. First, notwithstanding all that has been said about *declinations*, a large number of those appointed and published by the committee on organization, as first constituted, still hold their places, and for every one who has declined two equally well qualified have cheerfully accepted positions. Second, the only important vacancies now existing are in the office of president of the Sections of Physiology, Pathology, and Gynecology, the filling of which has been delayed by the executive committee for reasons we have stated in previous issues of this journal.

Not only is the *personnel* of the organization thus nearly complete, but the proper officers are actively engaged in arranging the work for each Section, and the executive committee will doubtless be ready to issue a supplementary circular, containing a full programme, early in May next. Already notices of contributions for several of the Sections have been received from prominent members of the profession in Great Britain, and indications favorable for a full European attendance are daily increasing.

[*From the Journal of the British Dental Association, January* 15, 1886.]

THE INTERNATIONAL MEDICAL CONGRESS OF 1887.—* * * In the course of last year we referred several times to the preparations which had been commenced in the United States for the holding of this Congress, and to the unfortunate difficulties which have arisen in connection with them, but some of our readers may perhaps be glad to have a connected account of the origin of these troubles, and of the progress of affairs up to the present time.

It will be remembered that at the last Congress, which was held at Copenhagen in 1884, a deputation from the American Medical Association invited the Congress to hold its next meeting in the United States, whilst another invitation was received from the medical profession of Germany, suggesting Berlin as the place of meeting. As it seemed doubtful whether Berlin would be an acceptable meeting-place for the French members of the Congress, the invitation to meet at Washington was accepted, and the claims of Berlin postponed for the time. On their return home the American Committee proceeded, according to the usual course, to invite the coöperation of the prominent men of all departments of the profession, without any regard to whether they belonged to the American Medical or any other association, and with highly satisfactory results. No Dental Section was at first proposed ; there had been none at Copenhagen ; but on remonstrance being made, a Section was established with the list of officers given at page 250 of our last volume.

But at the annual meeting of the American Medical Association, held at New Orleans in the spring of last year, that body claimed the right to review the action of the committee, which, although it had originally derived its powers from the association, had now become the committee of the Congress. The selections made by the committee were objected to, and the committee itself virtually superseded by fresh nominations, the association claiming to have the entire direction of the Congress, and to exclude all members of the profession who were not within its membership. This was to introduce a precedent which could not be tolerated for a moment. The International Congress meets for the advancement

of medical science, and not to increase the membership or add to the prestige of any particular society. Our British Medical Association is far less exclusive, and consequently a much more representative body than its American homologue, but it never attempted to assume the direction of the London Congress of 1881. The consequence of this ill-judged action was the resignation, with one or two exceptions, of every practitioner of first-class standing whose name had been mentioned in connection with the approaching Congress. Strong efforts were made to induce some of the most prominent of the retiring members to return, but without success; the whole of the Sections had therefore to be reorganized, the new executives being in lamentable contrast to their predecessors.

One of the first acts of the usurpers had been to abolish the Section of Dental and Oral Surgery; but later, realizing apparently that they must bid for all the help they could get, the new committee proposed to re-establish it; but it was now too late. The members of the dental profession in the United States were as disgusted with the pretensions of the Medical Association as were their medical confrères, and they have decided to make common cause with the latter and not to take part unless the organization of the Congress be placed on a satisfactory basis. We may add that the heads of the medical profession in Europe are equally opposed to the course pursued by the American Medical Association. In this country Sir James Paget and Sir William MacCormac have not hesitated to give very decided opinions in opposition to the claims of the American association, and most of the prominent men of France and Germany have intimated their intention of taking no part in the approaching Congress unless these claims are abandoned, or, at the least, unless a settlement be arrived at between the contending parties. Of this there seems to be little prospect, and, so far as can be judged at present, the meeting of the International Medical Congress at Washington seems foredoomed to be a miserable failure, though this may yet be in part retrieved by prompt concessions.

We notice that at the annual general meeting of the American Dental Association, in August last, a proposal was made that an International Congress of Dentists should be organized in connection with the next meeting of the association, and a committee was appointed to consider the project. We cannot help thinking that such a proposal at the present juncture was somewhat unfortunate, as likely to afford to the enemies of our profession an opportunity for misrepresentation and obscuring the points at issue. It may be that the American dentists are more concerned for the credit of their own branch than for the honor of the medical profession generally, but we consider that their true interest lies in helping their medical brethren to establish a satisfactory Congress organization, if this can by any means be effected. Only when it is seen that all efforts to this end are hopeless should an alternative scheme be considered. An International Dental Congress may be in store for us in the future, though we doubt whether the United States would be the best place in which to try the first experiment; but for the present let us be content with a creditable Section, and direct our influence and our energies with this view.

ANNUAL DINNER OF THE NEW YORK ODONTOLOGICAL SOCIETY.

If anything had been needed to demonstrate the high esteem in which modern dentistry and its practitioners are held, the gathering of distinguished representatives from every department of intellectual

effort at the annual dinner of the New York Odontological Society would have supplied the most convincing proof. Science, medicine, law, theology, and literature were there, in the persons of men who have added dignity and force to their high callings. Seldom, indeed, does any mere social event bring together so many notable men as were present at the Hotel Brunswick on the evening of February 10. The occasion was memorable in many ways, but perhaps chiefly from the evidence it afforded of the recognition, by men of the highest attainments in the most honored walks of life, of the essential nobility of labor performed with skill and intelligence in the interest of humanity.

A list of the guests would of itself establish all and more than is here indicated; but space will not permit. From others equally distinguished with any present were received letters of regret and expressions of fellowship based on esteem. Dr. Oliver Wendell Holmes paid a tribute to the profession in his usual happy vein, from which we excerpt the following:

> I will venture to propose, then, the Dental Profession, and this association as its worthy representative. It has established and prolonged the reign of beauty; it has added to the charms of social intercourse and lent perfection to the accents of eloquence; it has taken from old age its most unwelcome feature and lengthened enjoyable human life far beyond the limit of the years when the toothless and poor blind patriarch might well exclaim, "I have no pleasure in them."

It must have been no small gratification to some of the members of the society present, who could recall the time when dentistry was deemed an ignoble pursuit, to witness the unmistakable evidences of its advancement, not alone in their own estimation, but in that of their fellows in the learned professions; and especially gratifying must it have been to those who could not fail to know that they had themselves contributed in no small degree to this advancement.

THE WISCONSIN DENTAL COLLEGE.

The Milwaukee *Sentinel* of January 20, 1886, announcing the death and reporting the funeral services over the remains of Dr. George Morrison, appended the statement that the Wisconsin Dental College had already been reorganized since his death; that Dr. D. B. Devendorf had been chosen president, and that the college would hereafter be under the auspices of the Wisconsin Dental Society. Dr. C. C. Chittenden, Madison, Wis., writes to contradict the statement, and furnishes the following facts: The college was legally organized by Morrison, under a general State law, in 1880, and has been used by him to make money by the sale of "honorary" diplomas. The State society denounced the institution in 1881, and after the passage of

the dental law, in 1885, the Board of Examiners passed a resolution declaring it not reputable. This action was ratified by the National Association of Examining Boards, at Minneapolis, in August last. Only one of its diplomas has ever been presented to the Wisconsin board, and license was refused to the holder. George Morrison was the only dentist in the faculty. Dr. Chittenden sends us the following official statement of the secretary of the Wisconsin State Dental Society, which appeared in the Milwaukee *Sentinel:*

To the Editor of the Sentinel:

MILWAUKEE, January 31.—In your issue of the 20th inst., under a special dispatch from Delavan, there appears the statement that the Wisconsin Dental College has been reorganized under the auspices of the Wisconsin State Dental Society. This is false. The State Society nor Examining Board do not recognize diplomas coming from this institution, and it is to be regretted that such information has gone forth.

CLAUDE A. SOUTHWELL, D.D.S.,
Secretary State Dental Society.

AN APOLOGY.

OWING to a pressure upon our pages, we have been obliged to defer until our next issue a portion of the report of the meeting of the New York Odontological Society, and also the continuation of Dr. Morsman's series of papers on "Dental Caries," together with other interesting communications and valuable matter.

BIBLIOGRAPHICAL.

REPORT OF THE COMMISSIONER OF EDUCATION for the year 1883–'84. Washington: Government Printing Office, 1885.

This is the fourteenth annual report of the United States Commissioner of Education. Space permits us only to state that it is a voluminous work of over 1200 octavo pages, and contains, besides Commissioner Eaton's report proper (271 pages), abstracts of the official reports of the school officers of States, Territories, and cities; statistical tables relating to education in the United States, and a copious index.

VICK'S FLORAL GUIDE for 1886. With 2 colored plates and over 1000 illustrations. 8vo, 180 pp. Rochester, N. Y.: James Vick, seedsman. Price, 10 cents.

"Vick's Guide" is as usual full of interesting and valuable information concerning seeds, plants, flowers, and vegetables. Those interested in gardening, for pleasure or profit, will certainly be repaid the insignificant outlay required for a copy.

Pamphlets Received.

Transactions of the Dental Society of the State of New York, Seventeenth Annual Meeting, 1885. Rochester, N. Y.: Post-Express Printing Co.

Transactions of the Iowa State Dental Society, Twenty-third Annual Meeting, held at Des Moines, Iowa, May 5th to 8th, 1885. Des Moines: Mills & Co., printers.

Transactions of the Medical Society of the State of Pennsylvania at its Thirty-sixth Annual Session, held at Scranton, Pa., May 27, 28, 29, 1885. Vol. XVII. Published by the Society. Philadelphia: William F. Fell & Co., printers, 1885.

Clinical Notes on the Local Treatment of Disease: A Record of Practical Therapeutics. Vol. I, No. 2, January, 1886. Edited by Charles L. Mitchell, M.D. Philadelphia: Published by C. L. Mitchell, M.D., & Co.

An Experimental and Clinical Study of Air-Embolism. By N. Senn, M.D., attending surgeon to the Milwaukee Hospital, etc. Extracted from the Transactions of the American Surgical Association, Vol. III, 1885. Philadelphia: Collins, printer, 1885.

Philadelphia Social Science Association: "Instruction in Political and Social Science." Read at a meeting of the Association, November 12, 1885, by Prof. E. J. James. Published by the Philadelphia Social Science Association, 720 Locust street, Philadelphia.

Circulars of Information of the Bureau of Education. No. 3, 1885: "A Review of the Reports of the British Royal Commissioners on Technical Instruction, with Notes, by the late Charles O. Thompson, A.M., Ph.D., president of Rose Polytechnic Institute, Terre Haute, Ind." No. 4, 1885: "Education in Japan." Washington: Government Printing Office, 1885.

OBITUARY.

DR. R. L. ROBBINS.

At a meeting of the Board of Trustees of the Boston Dental College, held January 6, 1886, resolutions were adopted in reference to the death of Dr. R. L. Robbins, who had been a member and treasurer of the board from its organization to the time of his decease. The resolutions deplored the loss of a devoted member and co-worker in the interest of the college, "whose most marked characteristics were his strict integrity and conscientiousness, never admitting or tacitly acquiescing in any act tainted with dishonor." Sympathy was expressed with the bereaved family, to whom a copy of the resolutions was ordered to be sent.

PERISCOPE.

Some Points in the Pathology of Cystic and Encysted Solid Tumors of the Jaws.—Mr. F. S. Eve read a paper on this subject. After briefly noticing the clinical character of mutilocular tumors of the jaws, Mr. Eve referred to a lecture which he had delivered at the Royal College of Surgeons in 1882, and which was published in the *British Medical Journal* (January, 1883), in which he had shown that these tumors probably originated in epithelial ingrowths, invading the bone in the vicinity of teeth. This conclusion had recently received some confirmation from the observation of Malassez, that epithelial remains, probably of the enamel-organ, existed normally in the periodontal membrane. These tumors were a modified form of epithelioma, and were decidedly, though not in a high degree, malignant. The cyst-formation resulted from colloid degeneration and vacuolation of the epithelium; and the remains of cell-walls, together with undissolved threads of protoplasm, produced the appearance of a reticulum in the central cells of the columns and alveoli of which the tumor was composed; these, in many instances, were bounded by a layer of columnar cells. These peculiarities gave the tumors a resemblance to the rudimentary enamel-organ, on the type of which they were formed. Two views might be held regarding the mode of formation of the reticulum in the middle layer of cells of the normal enamel-organ. That generally entertained was, that the cells were compressed by the collection of fluid between them. The other, which Mr. Eve believed to be the correct explanation, was that the protoplasm of the cells underwent degeneration and solution. The latter was certainly true of these cystic tumors, and he had also observed "signet-ring" cells, and other evidences of degeneration and vacuolation of cells in the normal enamel-organ. Mr. Eve then described some cases of solid tumors of the jaw which were surrounded by a bony capsule, and might clinically simulate cysts. The first was a case of encysted solid tumor of the lower jaw, in a man aged 24. It had existed four years, but had not inincreased in size for three years. It was composed of small compressed, or angular, epithelium, with, in places, large columnar enamel-like cells, and scattered bands of dentine-like structure; no return had taken place two years after its enucleation. Case 2 was a museum specimen of malignant tumor, removed by Mr. Heath from the lower jaw of a man aged 32. It was composed of sarcoma-like tissue containing masses and columns of epithelium. It was not encapsuled, and was only alluded to as presenting in its minute structure some relation to the preceding. Case 3 was an encapsuled fibro-sarcoma of the lower jaw in a boy aged 15. A mass of bone, surmounted by a nodule of enamel, projected from above into the cavity containing the tumor. Vertically placed elongated cells, resembling odontoblasts, were found on parts of the surface of the tumor. A similar case was recorded by Duplay, in which the crown of a tooth occupied the bony capsule inclosing a fibrous tumor of the lower jaw. It was convenient to place these tumors in a separate class corresponding to the odontomes embryo-plastiques of Broca, but their origin in all cases from aborted teeth was open

to doubt. In conclusion, Mr. Eve made some remarks on the relations of the different varieties of odontomes. It appeared to him that Broca's group was not really a homogeneous one, but included types of various pathological formations; the odontomes coronaires and radiculaires being simply forms of hypertrophy, whilst the odontomes embryo-plastiques and odonto-plastiques must be regarded as true tumors.—*Proceedings Odontological Society of Great Britain, in British Med. Journal.*

Carbon Disulphide in Neuralgia.—Guerden recommends, as far superior to the menthol pencil in neuralgia, the application for three minutes of:

Carbon disulphide (rectified)	9 parts.
Essence of mint	1 part.

Shake well.

In superficial neuralgias, whether facial, dental, or intercostal, and in superficial rheumatic pains, this application produces instantaneous relief, and not unfrequently a cure. In the deep neuralgia, as sciatica, it is necessary to project the solution upon the painful part by means of an atomizer. Actual freezing of the skin is unnecessary. Dental neuralgia usually succumbs to this treatment applied to the corresponding cheek—a slight application to the gum, or the insertion into the carious tooth of a pledget of cotton moistened with the solution, being occasionally advisable. Very obstinate facial, dental, and pharyngeal neuralgias may be subdued by gently introducing into the external auditory meatus a pledget thus moistened, squeezed out, and covered by a layer of dry cotton.—*Revue de Thérapeutique, Medical News.*

HINTS AND QUERIES.

To the Editor of the Dental Cosmos:

I would ask "W. H.," who, in the January number of the Dental Cosmos, introduces to the profession Dr. G. O. Rogers's method of disinfection and antiseption: Does the doctor claim success in all teeth whose roots are in a normal condition externally? If dryness is a requisite to success, how does he manage to reach the apical end of those roots which fold back on themselves like folding the fingers on the palm of the hand; also, those which turn at a right angle, such as baffle the most expert of us? The doctor must reach all of those points if dryness is the requisite. Would "W. H." kindly enlighten us how he does it? I doubt the doctor's ability in this form of roots, but would be pleased to know how it is done.—J. Calder, D.D.S.

Reply.—The theory of Dr. Rogers contemplates the destruction of all germ life within the pulp-canal by the application of heat, which, if "repeated according to circumstances," should prove effective in such apical portions of the canal as may not be directly reached by the incandescent wire, but in a mere sketch of the method extraordinary cases could not reasonably have been expected to be individually described. It is, however, not improbable that by an expert in the use of the electric cautery a very fine platinum loop might be pushed through the

canal to the apex of one of "those roots which fold back on themselves," or "turn at a right angle," and the entire cavity be made dry by the heat of the loop. While yet dry and warm, the canal could be filled with gutta-percha dissolved in chloroform. With such resources at command, need there be any more cases "such as baffle the most expert of us?"—W. H.

Is it not time that some of those who do the talking at dental associations were ready to confess that we as dentists do not know quite and completely *all* about teeth? I note, in the discussion at the last meeting of the First District Dental Society of the State of New York, that one speaker stated that it was first acids corroding the enamel, and then the brush wearing away the corroded substance, which caused the polished grooves and excavations on the labial and buccal surfaces of the teeth.

Right here, only day before yesterday, comes a poor woman, guileless and guiltless of tooth-brush and tooth-brushing, whose lower incisors, cuspids, and bicuspids are worn away almost to the pulps; at least one-third of the tooth-substance gone,—not worn in grooves, but flat, as if filed away with a flat file.

Is it not probable that some occult chemistry is at work here? In the case of these teeth the lower incisors articulate directly with the upper, the molars being lost, and yet the upper incisors have lost a large part of their cutting-edges, while the lower are almost intact at the same point; and, again, the upper teeth are not denuded at all on their labial surfaces.

Only a week or two ago I saw a superior lateral cut more than half way through, the circumference of the groove in this case making about two-thirds of a circle, almost equalling in shape the letter C. No brush could reach *this* place. —J. B. Hodgkin.

Curious Position of a Supernumerary Tooth.—A young lady of about sixteen years consulted me in January, complaining of her upper lip projecting, and being at times very sore. Upon examination I found the lip protruding considerably near the roots of the incisors, and apparently attached to the gum about their necks. Introducing a probe between the lip and gum, it came in contact with a hard substance. After separating the attachment between the lip and gum, I found a supernumerary tooth directly between the roots of the central incisors, and lying horizontally to them; the crown imbedded in the patient's lip. After pressing the lip up firmly, I removed the tooth. All her other teeth are in proper position.—N. E. Foote, D.D.S., *Chateaugay, N. Y.*

How to make a plate fit any mouth tight without an air-chamber: First examine the mouth, and note particularly the hard and soft places. At the places which are hard scrape the impression down half a line, and where the mouth is soft scrape the male cast down half a line.—L. B. Wilson, *Cumberland, Md.*

To prevent glass stoppers from sticking, use glycerin spread upon the stoppers. It will confine the most volatile preparations, and is specially useful when the sandarac or shellac solution is kept in a small jar with a cover, though the stoppered bottles may be kept free by repeated applications of glycerin. Fifteen years' experience may be taken as a guarantee of the usefulness of the remedy. In filling root-canals with chloro-percha, when all is ready, wipe the cavity and its approaches with glycerin on cotton, using as little as possible, and coating with it also the instruments. The extraneous gutta-percha may thus be readily removed after filling the canal.—G. A. Bowman, D.D.S.

AMERICAN DENTAL ASSOCIATION.

[We lift this form from the press to permit the following announcement, prefacing it with the statement that the California State Odontological Society has invited the Association to meet in San Francisco.—Ed. Dental Cosmos.]

The Union Pacific Railway and connecting lines will give all members and delegates to the American Dental Association and their families the privilege of the exceedingly low rates to San Francisco that are to be given to the Grand Army the coming summer, if the association will hold its annual session there the last week in July. These rates will be $50 for the round trip from Missouri River points, such as Omaha, Leavenworth, St. Joseph, or Kansas City, etc.; about $60 from Chicago, St. Louis, Cincinnati, etc., and $75 or $80 from the Atlantic coast points. Tickets will be good from July 1st for thirty days going, and eighty-five days returning, and will be good by any of the trans-continental lines returning. Other lines will probably accede to the same rates on the outward trip.

It is an opportunity to hold our meeting on the Pacific Coast that we will probably never have again. All dentists desiring to attend the meeting of the association will be given the same privileges of railroad rates. By the advice of a large number of the members of the association I am requested to ascertain the views of members of the association and the profession with regard to the matter, and all who would like to have the meeting held at San Francisco will please send their names to

A. M. Dudley, Salem, Mass.

THE

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ORIGINAL COMMUNICATIONS.

DENTAL CARIES.—VII.

BY A. MORSMAN, M.D., D.D.S., IOWA CITY, IOWA.

(Continued from page 87.)

PART SECOND.—NOSOLOGY.

4. DIAGNOSIS, TREATMENT, AND PROGNOSIS.

DIAGNOSIS.—Usually carious cavities are plainly perceptible, but diagnosis is sometimes exceedingly difficult. In its early stages an approximal cavity is quite hard to locate, although the symptoms point plainly to its existence. In such a case wedging by cotton, rubber, or wood becomes necessary to bring it into view. Pain is the subjective symptom of dental caries, but it is exceedingly unreliable. At times it is diffuse and cannot be located; the whole side of the face is affected, and the patient is said to have neuralgia; again, the ear seems to be the troublesome member, or headache and general malaise may arise from it.

Quite often patients locate their pain in a perfectly sound tooth. In such cases the adjoining teeth and the homologous teeth of the opposite jaw should be carefully examined. Sometimes even the teeth in the opposite side of the mouth may be the responsible ones. Pain in a lower bicuspid may have its origin in the wisdom-tooth of the same side, because the mental foramen is situated just below the bicuspids, and the irritated nerve emerging here may be in a measure strangulated or compressed. And yet pain is a symptom of value if rightly comprehended. Pain on taking sweet substances into the mouth indicates simple caries. It may present occasionally in complicated cases, and *rarely* in superficial caries. But I consider it quite diagnostic of this second stage of the disease. Sensitiveness to cold air or drinks is a symptom of the malady, but it is quite delusive, and does not point to any particular stage, save that it indicates a normal pulp. Sensitiveness to *warm* drinks or applica-

tions points unerringly to complicated caries, and also to serious pulp trouble. Sharp fugitive pains or decided aching of short duration are frequent in the second stage, but a continuous toothache or nocturnal pains should at once warn the operator of pulp-exposure. Pain upon sharply tapping the tooth with an instrument may indicate either the third or fourth stage. If the former, it is due either to pulpitis or a dying pulp. In the fourth stage it is due to periostitis or abscess. Pain on applying suction or in mastication is most common in complicated caries.

Thus we can, by judiciously questioning our patients, satisfy ourselves of the existing condition before we have touched the tooth, and thus guard against giving more pain than is necessary in making further examination. It is sometimes necessary to impress a patient with the importance of correct replies to inquiries, or they will answer at random; hiding pain to avoid an operation, or exaggerating it to excite sympathy. All subjective symptoms are somewhat unreliable, until through experience the expert diagnostician can rightly interpret them. But study them and "human nature" both at once, and they become valuable aids.

Dental caries is not always accompanied by pain. Many cases are painless even to the end. In these we must depend upon objective symptoms. Remembering the localities where caries is likely to occur will greatly aid us. A mouth-mirror and a fine-pointed probe are essential to an examination. Beginning at the upper third molar, pass successively over each tooth in that jaw, and return in the same manner on the lower jaw. Regard all fissures with suspicion, and press the point of the probe into them their entire extent. If they are perfect, the feel of the enamel is easily recognized. Approximal surfaces should be closely scrutinized. A bit of floss-silk drawn between the teeth will sometimes indicate by catching that the teeth should be separated, and further examination made. White opaque spots are almost pathognomonic. After a little practice the eye will never be deceived by them, and the chisel will immediately verify the decision. Pits, defects, and colored spots should be examined carefully. No examination should be hurried. Such only results in disappointment to the patient, and loss of patronage to the dentist. It is our duty to be thorough and to inform our patients of the condition of their teeth, but without exaggeration. If they then neglect them the error is theirs.

Treatment.—The treatment of dental caries comes naturally under three heads,—preventive treatment, treatment by excision, and treatment by obturation, or filling the cavity with some suitable material. By far the largest number of cases require the latter, excision being limited to superficial caries and only applicable in

a minority of cases. Prevention is not yet fully understood. We know enough, however, if our directions were always carried out, to save much pain and loss of teeth, and to actually largely reduce the number of cases of the disease. Unfortunately but few people appreciate the value of the teeth sufficiently to use any precautions for their safety, and still fewer regard the dentist as an adviser to be consulted, as is the physician, until his skill is required in relieving their pain or in replacing a portion or all of the organs their indifference has lost. There is rarely an excuse for complicated caries. Usually the patient receives due warning, perhaps many times repeated, that something is wrong. And yet more than two-thirds of our cases are complicated ones. What preventive treatment will do in the hands of future dentists remains to be seen. At present it can scarcely get a hearing. We pass to its consideration.

Prophylaxis.—The basis of preventive treatment is cleanliness. Well-organized teeth will endure almost anything, and so it is not uncommon to see very filthy mouths with no caries. Even of those persons who make an attempt in this direction but few attain to results of any value. Children's teeth are woefully, shamefully neglected, and it is with children that preventive treatment has the best opportunity and could show the best results. Not later than the age of two years a child should have paid its first visit to the dentist, and from that time on it should be in his hands. The dentist's competency is presupposed, and it behooves every student who would shine in the profession to qualify himself on this point. I shall treat the subject in detail, therefore, even at the expense of tediousness.

A child's brush should be small and narrow. It should not be more than an inch in length besides the handle. The longest bristles should be at the tip, and they should shorten as they approach the handle, but should form a slight concave surface. They should not be stiff, and should be serrated crosswise, but not deeply. The nurse first, and the child when old enough, should be instructed (by example) in its use. Placing it against the teeth on the margin of the gum, give it a rotary motion down on the upper jaw, up on the lower jaw, all around on the outside surfaces of the teeth, being careful not to miss the posterior molars; then over the masticating surfaces, backwards and forwards, inwards and outwards, after which the mouth should be rinsed. It is quite difficult to teach a child to rinse the mouth, but patience will accomplish it. The brushing should be done at night. I do not think it is judicious to attempt the use of dentifrices on children's teeth. The water used might be made slightly alkaline with advantage. Recognizing the frequent occurrence of caries in approximal surfaces, and the cause

in the accumulations of débris here, the habit of using the tooth-pick should be early inculcated. Only the quill should be used for this purpose, and there is a small size in the market that answers very nicely. Remember that the teeth are for use, and teach thorough mastication. There is nothing injurious about the habit of chewing gum, and I am inclined to think its reasonable encouragement in youth would be advantageous.

The dentist should see the child frequently, and cavities should be filled in their inception. *This is important.* It is exceedingly unfortunate when the pulp in a temporary tooth has to be destroyed, and it is very essential to our success that we give the little patient no pain. I should avoid that by all means, although the cavity was not thoroughly excavated. Better put a filling on top of loose débris, if you can make the edges reasonably tight, than to hurt the child so that your next efforts meet with his resistance. Small cavities are quickly prepared with an engine-bur or spoon-shaped excavator, and these instruments are readily used if the child can be interested in your movements and his confidence gained. It is not usually difficult to handle children who have not been frightened, but scarcely a child comes to us who has not overheard or been told some frightful story about the dentist. The assinine stupidity of parents and guardians in this matter is only equaled by the contemptible desire on the part of some persons to magnify every twinge of pain into an agony. Such matters seem to be considered conversational *bon mots*, and they make us a vast amount of trouble in doing our duty with young children and timid persons.

Children's sittings should always be short, and, fortunately, it is easy to make them so. Gold should never be used in deciduous teeth. It is entirely unnecessary, and its use should be classed among the reprehensible follies of the past. Even in those permanent teeth that are erupted before the age of twelve it is better to use plastics, unless the cavity is such a one as will make a gold filling a small matter. If care has been taken thus far, the first permanent molar will not erupt into an environment that will cause its early decay. I think it is a good practice, however, after this tooth has erupted, to make a wide separation between it and the deciduous molar, in such a manner that the space can be readily kept clean, and cannot close up. This should be kept in view at any time when a filling is necessary on the posterior surface of the deciduous molar. Ulcerated or necrosed teeth or roots should be removed; indeed, I regard the attempt to save deciduous teeth, where the pulp is lost or devitalized, as of doubtful policy, although I practice it when the child is to be under my surveillance.

For adults the directions regarding the care of the teeth should

have reference to their necessities. As I have already said, some teeth will endure the greatest neglect, while others will require constant and earnest efforts. Rigid rules for all are not advisable. As a matter of cleanliness simply, every one should use the brush once a day, but it may not be a necessity, and need not therefore be urged. Teeth of inferior structure should be brushed night and morning with great care. The adult brush should be the same as the one described, save increased size. Most of the brushes in the market are altogether too large. There is nothing gained by using a large brush, while there is much lost by its inadaptability. A three-row brush, an inch and a half long, is large enough. It should be made of the best bristles, selected for moderate stiffness. The serrations should be deeper than in the child's brush.

I am not favorably impressed with the multitudinous fancy preparations called dentifrices and tooth-powders. All that are of value owe their efficiency to chalk; orris-root is a useless accessory; charcoal, pumice, cuttle-fish bone, and alum are pernicious, and soap and its substitute, the tincture or infusion of *quillaya saponaria*, are disadvantages. Astringents in tooth-powders should never be used except for special cases. Some antiseptic is a good addition, and the alkalinity of the preparation may be increased by the addition of soda or borax. I frequently prescribe as follows:

℞.—Creta præparata, ℥ ij;
Acidi phénique, ʒ ss;
Sodæ bicarb., ʒ ij;
Ol. sassafras, gtt. xx.
Misce.

Oil of eucalyptus can be substituted for carbolic acid, and wintergreen or other essential oil for sassafras, if more agreeable. As sassafras and wintergreen have a stimulating effect upon the gums, I prefer them. The quill took-pick is of as much importance as the brush, and should always be used after eating. A bit of thread or floss-silk is of value at times as a substitute for the pick.

Examinations by the dentist should be made often enough to prevent pulp-exposure, and to this end it is well to record the tooth-organization upon the case record, so as to indicate the number of times per year the patient should be seen.

If a little prepared chalk, or of the prescription I have above given, be rubbed between the teeth and into the sulci at night and allowed to remain until morning, it will be found very beneficial, and should always be recommended when the teeth need special care. I have noticed the beneficial effect of this treatment in incipient caries at the gum-margin, when it had become highly sensitive to the touch of an instrument or the finger-nail. After two weeks' application

of the chalk the sensitiveness ceases entirely, and if it be continued with reasonable perseverance no surgical interference is necessary.

Patients should be impressed with the importance of thorough mastication of food and the *use* of the teeth. Dyspepsia or allied disorders should receive proper treatment.

Those patients who have stringy, viscid saliva are pretty generally physically depressed. They should have good, rich food, out-of-door exercise, and bitter tonics. An alkaline mouth-wash should be used frequently to rinse the mouth. If the muscles of the cheek and lips are loose and flabby, its use should be encouraged.

I am not much of a believer in the administration of lime-salts for the improvement of the teeth. Doubtless an occasional case occurs where the system requires more lime than it receives, but I should consider them very rare, and should rather depend upon a change of diet.

In all cases where it is possible, remove every known cause of caries. Plates should not be made to fit closely against natural teeth, as is so frequently done. Avoid clasps as far as possible, and when used the patient should be warned of the necessity for cleanliness. Scrutinize fillings closely, and see that no leaky ones are overlooked.

In regard to separating teeth as a means of preventing caries, there is much to be said on both sides. I cannot look upon that policy as a wise one which anticipates disease and mutilates the teeth to prevent what may not occur. Certainly the teeth could not be better adapted to the use for which they are intended than as nature has shaped them. If that is true, every alteration made by man is a mutilation, and detracts from their use and beauty. But after caries has developed, even in its superficial stage, permanent separations are advisable. They should be made self-cleansing,—that is, the widest opening should be on the palatal or lingual surfaces. They are made with corundum-wheels and emery-paper disks, and should be left nicely polished. Separations that will permit the crowding of foods upon the gum are not well made.

Excision.—Superficial caries, if so located that the entire surface can be removed without injury,—as, for instance, when a separation is desirable,—is well treated by excision. Cases of slight depth may be treated by this method in any location, provided that after the operation is performed there shall be no lodgment for débris, and the tooth is neither injured in appearance or utility.

Obturation means simply the filling of the cavity with some substance capable of preventing, for a time at least, the lodgment of the *causus nosi* therein. The operation in all its details is exceedingly complicated. Its description belongs to Part Fourth.

PROGNOSIS.—In simple caries, where the tooth-structure is fairly good and treatment is well directed, this is always favorable. In complicated caries it is not so good. The result of treatment directed to the preservation of an exposed pulp is always to be regarded with anxiety. When roots are filled, although skillfully done, there is a *slight* possibility of future periosteal trouble; and if, through insurmountable difficulties, roots are not well filled, or a portion of devitalized nerve-fiber cannot be removed, this danger increases. Even in simple cavities, if the tooth-structure be very inferior, the prognosis is uncertain, as secondary decay is frequent in such teeth.

In general, however, there is probably no ailment the treatment of which is so generally successful as dental caries in skillful hands. There is much bungling dentistry, and, unfortunately, all must bear the opprobrium.

Cessation of the disease occurs occasionally without treatment, but such instances are very rare after a cavity is once formed.

(To be continued.)

NOTES ON NEW REMEDIES.

BY A. W. HARLAN, M.D., CHICAGO, ILL.

(Read before the Illinois State Dental Society.)

THE permanent additions to dental materia medica are coming but slowly to the front. The reason is obvious, as all practice must, in the first instance, at least, be more or less empirical. The more recent new drugs and compound substances introduced into dental practice may be catalogued in very short space,—peroxide of hydrogen, iodide of zinc, eugenol, sanitas, corrosive sublimate (not new but applied for a new purpose), aconitia, chloride of aluminum, fluid extract of tonga, calcium sulphide, sulphate of gelseminum, boroglyceride, eucalyptol, iodoform, chinolin tartrate, menthol, naphthaline, terebene, cannabin, cocaïne, pheno-resorcin, resorcin, and a few others, which it is not necessary to enumerate. All of the above-mentioned substances have been investigated more or less, principally by medical practitioners; but I am happy to state that not a few have passed their crucial tests in the beginning by practicing dentists. Your attention is solicited for a brief consideration of the properties of resorcin, pheno-resorcin, cocaïne, cocaïne-hydrochlorate, and a combination of hydrogen peroxide and an aqueous solution of corrosive sublimate.

Resorcin, $C_6 H_4 (O H)_2$, and pheno-resorcin:

Witthaus ("Medical Chemistry"): "Resorcin. Colorless prismatic crystals; fusible at 110°; boiling at 270°; obtained by the action of potash on galbanum, assafetida, etc."

Stocken ("Dental Materia Medica"): "Resorcin. The following advantages over carbolic acid are claimed for it: more soluble in water, almost destitute of odor, less irritating, and its toxic action slight."

Bloxam ("Chemistry," fifth edition): "Resorcin, $C_6 H_4 (O H)_2$, is a very soluble crystalline phenate, obtained by distilling the extract of Brazil-wood, or by the action of sodium hydrate upon benzine-disulphonic acid, obtained by the action of sulphuric acid on benzine."

Edes ("Therapeutic Handbook of U. S. Pharmacopœia"): "Resorcin. * * * It is closely related to phenol, and is, like it, a powerful antiseptic in the proportion of one to one hundred. It is soluble in all the ordinary solvents except chloroform and sulphide of carbon. * * * It has, of course, the great advantage over carbolic acid of much less toxic properties. Externally it may be used for all the surgical purposes of carbolic acid, and is preferable to it on account of absence of odor, of danger of poisoning, and its solubility in any proportion of water."

Lewin ("Incidental Effects of Drugs"): "Resorcin. If two or three grammes (gr. xxx. to xlv.) of resorcin are administered in solution or in substance, an effect is manifested in a very few minutes. There appear giddiness, buzzing in the ears, and an increase in the frequency of pulse and respiration. The face is reddened, and the eyes become brilliant, the patients being in a condition resembling intoxication. They are sometimes delirious, and manifest hallucinations; speech is stammering, and slight convulsive tremors appear in the hands."

Biddle ("Materia Medica"): "Ammoniacum Resorcin * * * is obtained from the resin"(galbanum). "From the resin are obtained *umbelliferone* and *resorcin*."

Bartholow ("Materia Medica and Therapeutics"): "Resorcin (not officinal). *History.*—Resorcin is a chemical compound discovered by Hlasiwetz and Barth, and was obtained from certain resins by the action of fusing alkalies. They assigned to the new compound the name *resorcin*, partly because it is derived from a *resin*, and partly because it has some similarity to *orcin*, a peculiar substance obtained from orchil. Subsequently resorcin was constructed synthetically by Körner, and at the present time it is obtained in various ways, the product being both pure and cheap (Andeer). *Properties.*—Resorcin is a member of the phenol group. It occurs in tabular prismatic crystals, rather shining and lustrous; somewhat sweetish to the taste, with a little after-pungency. * * * In odor it is somewhat like phenol, but not nearly so pronounced. It is freely soluble in water, in the proportion of 86.4 parts of resorcin to 100 parts of water at 0° C. It is dissolved by all liquids except

chloroform and carbon sulphide. * * * Albuminous liquids, treated with a concentrated solution of resorcin, become turbid by the formation of an albuminate of resorcin. * * * The dose for usual purposes ranges from five to fifteen grains. For a decided anti-pyretic effect a drachm may be given, but this amount could not be frequently repeated. Five grains may be given every two hours in an ordinary case. *Physiological Action.*—Resorcin does not irritate, nor is it absorbed by the unbroken integument. The solution, injected into the subcutaneous tissues, produces but little irritation, and never inflammation and abscess. Applied to the moistened mucous membrane, it causes vesication, and a white blister forms like that from carbolic acid (but not so severe). It has decided anti-ferment properties, arrests decomposition in animal tissues, deodorizes, and is destructive of the minute organisms on the presence of which putrefactive decomposition is dependent. A one per cent. solution will prevent the decomposition of urine when exposed to the air for months (Andeer). Applied to unhealthy wounds, it arrests decomposition, destroys the fetor, and promotes healthy cicatrization (Du Jardin-Beaumetz). * * * The elimination of resorcin takes place almost entirely by the urine * * *; the greater part absorbed is excreted in an hour. *Therapy.*—Resorcin, having much less irritating property, is generally preferable to carbolic acid for internal and subcutaneous use. * * * It has been used with great success, locally, in *syphilitic* and other sores of an unhealthy and sloughing character. Its solution may be applied as spray in affections of the nose and throat, *catarrhal*, *ulcerating*, or *specific.* Andeer affirms that, applied in crystals or in powder, it is the most efficient remedy in *diphtheritic* affections, and he has employed it with equal success in *anthrax.* * * * Pheno-resorcin, carbolic acid and resorcin, sixty-seven parts of the former, and thirty-three parts of the latter,—this mixture crystallizes by cooling, and on the addition of ten per cent. of water becomes a liquid which mixes with water in all proportions."

Prosser James ("Therapeutics, Respiratory Passages," etc.): "Resorcin * * *, being a disinfectant externally, two to ten per cent. solutions are used, and these are not irritant, although resorcin itself is a caustic. * * * The taste being somewhat pungent, it should be well diluted."

J. M. Bruce ("Materia Medica," etc.): "Resorcin. Action and Uses: Externally, resorcin is antiseptic and disinfectant without being irritant. In ordinary solutions (two to ten per cent.) it has been used as a dressing for all kinds of sores and wounds."

To the above extracts from standard authorities I can add the following: Crystals of resorcin, applied to fungous growths of the

pulp or gums, will destroy them after one or two applications. Foul-smelling discharges are rendered odorless by the application of five per cent. aqueous solutions of resorcin. Instruments are disinfected by being dipped in such a solution. I have injected ten per cent. solutions into sinuses leading from necrosed bone with excellent results. Weaker solutions have been very efficient as injections into pyorrhea pockets. As a disinfectant for foul mouths and ulcers in the mouth, it is a very pleasant and perfectly reliable drug. With the assistance of Dr. L. L. Davis, of Chicago, the following experiments were made to show its effects on bacteria. Experiment one: Stagnant water from the roadside maintained at a temperature of 70° F. for six days. To one drop placed on a slide, and a hair interposed between it and the cover-glass, was added one drop of a solution of resorcin gr. ii. to aq. dest. ♏ cxx. The rod-shaped bacilli in the drop of water were very lively at first, but in a few minutes their motions became slower, until in eighteen minutes all motion ceased. Moderate heat and the addition of distilled water failed to revive the organisms. Experiment repeated with the same result. Experiment two: Infusion of banana skin five days old; same temperature; solution of resorcin gr. v. to aq. dest. ♏ cc. In thirteen minutes all motion ceased; life extinct; failed to revivify the organisms. Experiment three: Hay infusion eleven days old; same temperature; solution of resorcin gr. x. to aq. dest. ♏ xc. In six minutes all motion ceased; life extinct; could not be revivified. All of the above and other experiments were conducted under the microscope, and the organisms magnified 360 diameters. Experiment four: Infusion of prairie-grass, straw, various seeds, grains of wheat, sea-fern, bits of meat, melted snow, stagnant and hydrant water, 65° to 75° F., six months old. Pheno-resorcin one hundred parts to aq. dest. ten parts. The organisms at the edge of the cover-glass ceased to move in thirty seconds; those nearer the center became motionless in ten minutes; they could not be revived. Experiment repeated, with same result. Experiment five: Same infusion; solution of pheno-resorcin one in three hundred; the bacterium lineola ceased all motion in one hour and ten minutes; the rotifers in one hour and fifteen minutes; they could not be revived. Experiment repeated; same result. Experiment six: Same infusion; eugenol minims one; alcohol ninety-five per cent., ♏ xlix.; life extinct in five minutes; could not be revived. Experiment seven: One minim of the above was added to ♏ xxv. of aq. dest., and then one drop was added to the same infusion under the cover-glass, and in twenty minutes all motion ceased; failed to restore vitality or movement. The absence of odor and the freedom from irritating properties of resorcin will render it

a valuable injection for fistulous abscesses. Aqueous solutions of resorcin may be used in the treatment of engorgement of the antrum, catarrhal or otherwise. The crystals may be applied to syphilitic patches on the oral mucous membrane, with certainty of the best results. An agreeable disinfecting mouth-wash may be made by prescribing:

℞.—Resorcin crystals, ʒ ii;
Thymol crystals, gr. xx;
Rose-water, q. s. ad, f℥ viii.
Dilute to suit.

Solutions of resorcin in eugenol, eucalyptol, cinnamon, and other oils may be made in all proportions. Pheno-resorcin, to which has been added ten parts of water, painted on the surface of a forming abscess, will prevent a patient from feeling much pain on the application of a bistoury or lancet. Pheno-resorcin is more caustic than resorcin, and is a better obtunder of pain than the latter. I have not made sufficient clinical use of it to further state its good qualities.

Cocaïne—$C_{17} H_{21} N O_4$. Cocaïne Hydrochlorate: Almost every specialist in medicine has used some form of cocaïne since the discovery of its local anesthetic property by Köller less than a year ago. From my own use of the various preparations since the middle of October last, I am able to offer the following: The two and four per cent. aqueous solutions are not useful in obtunding sensitive dentine, even after repeated and prolonged application to superficial or even deep-seated cavities. A ten per cent. aqueous solution is of some value as an obtunder of sensitive dentine after bathing the cavity for ten minutes or longer. The two and four per cent. solutions, applied to an exposed pulp (not inflamed), will produce anesthesia in from eight to fifteen minutes. The same solutions applied for thirty minutes or longer to an inflamed or congested pulp produced no effect whatever. Aqueous solutions painted on the gums before the adjustment of the rubber dam, or the application of a clamp, are uniformly successful. I have injected one to two drops of the four per cent. solution into pyorrhea pockets, and after waiting five to eight minutes have removed deposits and scraped the edges of the alveoli with comparative ease; but never succeeded in getting a patient to acknowledge entire freedom from pain. Six, eight, and ten per cent. aqueous solutions have not been more efficient in such cases. The aqueous solutions painted on the gums inclosing a forming alveolar abscess have not proved uniformly successful in the prevention of pain from cutting with a bistoury or lancet. The five per cent. oleate of cocaïne I have used since its first introduction. It is more efficacious for use prior to opening an abscess. For sensitive dentine it appears to be too feeble for general good results. I

have not used it on a normal pulp. A ten per cent. solution of the hydrochlorate in eugenol is the best preparation for sensitive dentine that I have used. In very superficial cavities it requires from ten to twenty minutes to be effective; in moderate-sized and deep cavities I wait five minutes, and begin cutting while the cavity is flooded with the solution. In many cases the patients have stated that no pain was felt, even when a retaining-point was being drilled. I conclude that eugenol is the best solvent for the hydrochlorate in all proportions when it is desired to obtund sensitive dentine. Stronger solutions in eugenol at present do not appear to be more effective than the ten per cent. solution. I have been experimenting with solutions of the alkaloid in eugenol, but these are so recent that I have nothing definite to say on that point. A ten per cent. solution of the alkaloid in ether appears to be the best solution for application to an inflamed pulp when it is desired to extract it. You are all aware of the difficulty of extracting a pulp after devitalization with arsenic, especially when it is attempted within a day or two after the application has been made. The rapid evaporation of the ether appears to assist, by refrigeration, the anesthetic action of cocaïne, and in most cases the pulp may be removed with a broach in from one to two minutes. Apply it with a dropper or a pipette, or on cotton. Stronger solutions in ether are not more useful than the above. My experience has been limited to the extraction of three teeth with the aqueous solution of hydrochlorate of cocaïne. In each case I used the four per cent. solution. The experiments were not entirely satisfactory to either of the patients. I extracted one upper molar root by using the oleate, and the patient experienced about as much freedom from pain as though the gums had been painted with water. I do not believe that our present knowledge of the various solutions of the alkaloid, hydrochlorate, citrate or other salt justifies us in promising to extract a tooth painlessly by using it, even when injected hypodermically. To sum up my experiences with cocaïne would be to say that we have one more drug which need not become dangerous in the hands of the empiric, and which has already proved itself indispensable to the dental surgeon in many ways that I have not touched upon.

Peroxide of hydrogen, one part, and aqueous solution corrosive sublimate, one in one thousand, one part, in a securely stoppered bottle, covered with dark paper, and kept in a cool, dark place, is recommended for use as an injection into a blind abscess or pyorrhea pockets for cleansing the débris, and as a potent germicide where such is needed. According to Pasteur, living organisms are of two classes,—those which must have oxygen (ærobic) to sustain life, and those which are instantly destroyed by oxygen (anærobic). In

the above combination we have a compound or mixture which is fatal to both forms of putrefaction producers. A few months' clinical use of this combination has satisfied me that in the beginning of the therapeutic treatment of cases of pyorrhea we may expect to destroy the living organisms in the pockets, and also the spores, as microscopical experiments have disclosed. This combination of germicides is useful for cleansing a furred tongue, removing sordes from the teeth, disinfecting instruments, and as a primary injection into wounds made by the surgeon on alveolar processes for cleansing the débris. It may be used as a dressing for a root-canal, but when sealed therein with soft gutta-percha two or three perforations should be made through it to permit the escape of liberated oxygen or other gases. Experiment one: Infusion of prairie-grass, straw, various seeds, grains of wheat, sea-fern, bits of beef, and other articles were placed in an open-mouthed bottle, and covered with stagnant water from the roadside; after a time melted snow was added; then, as the water evaporated, hydrant water was added; this was maintained at a temperature of from 65° to 75° F. for six months; one drop of the infusion was placed on a slide, the cover-glass adjusted by interposing a hair between it and the slide, and, while my assistant added a drop of equal parts of H_2O_2 and one in one thousand of the aqueous solution of bichloride of mercury, I noticed its effect on the organisms in the field of the microscope. In less than thirty seconds all motion ceased. The most conspicuous organisms in the infusion were bacteria lineola and rotifera. Experiment repeated with same result. Moderate heat and the addition of distilled water failed to revivify the defunct bacteria. Experiment two: Same infusion; H_2O_2 one part, and solution of corrosive sublimate one in two thousand, one part; experiment performed in the same manner as above. All motion ceased in eight minutes. Experiment repeated with same result. Moderate heat and the addition of distilled water failed to revive or cause any voluntary motion whatever. The conclusions to be drawn from the above experiments are so obvious as to need no comment. The propriety of transferring the micro-organisms acted upon by the above solutions to sterilized fluids or solids to demonstrate that the spores of the various organisms present in the infusions examined were also destroyed has not been lost sight of, as experiments of that character are now being conducted which, it is believed, will show that in every case the solutions used were sufficiently potent to prevent the development of spores.

A PHASE OF BRIDGE-WORK.

BY JAMES B. HODGKIN, D.D.S.,

PROFESSOR OF PATHOLOGY AND THERAPEUTICS IN THE BALTIMORE COLLEGE OF DENTAL SURGERY.

THE possibilities of this style of work seem largely on the increase, and although it is and will be sadly abused—what work is not?—it fills a gap in dentistry which needed filling. An operator who makes this style of work a specialty is reported as saying that he was satisfied if three-fifths of the cases he turned out as finished were successes. Just what his standard of success is I do not know, but success worth calling such, I think, should not be deemed as attained until more years of probation are passed through than much of the bridge-work has yet sustained. If only such work as comes back in a few weeks for readjustment be rated as failures, then the standard is too low.

It occasionally occurs that a case presents itself in which a plate is undesirable, and yet in which the ordinary bridge-work is not applicable. As an illustration, take a case in which the central incisor is lost, root and crown, the adjoining teeth being in fair condition. Certainly we are not justified in such a case in amputating the crowns of the adjacent central and lateral for the sake of a bridge. Even had the central incisor a cavity and the lateral also, no good operator would follow a "craze" and amputate these, but rather fill them and make a plate for the gap.

As far back as my familiarity with dental literature goes—say twenty years—there are reports of teeth anchored by "little griffs" into the adjacent teeth, in cases resembling those under consideration, and many successes are reported.* But any one who has tried the experiment of filling with cohesive foil around these projections, which are to be solidly anchored into the adjoining teeth, will acknowledge that the difficulties are so great as to render many failures probable. It is certainly one of the most difficult things I have ever undertaken to hold such a tooth in position and fill the anchorages, and in many cases of undercut teeth it is well-nigh impossible.

Some years ago the following case presented itself, and is a type of a class of cases in which the method about to be described may be attempted with reasonable hope of success.

The left central incisor had been lost from a blow. The right central had a cavity of some size on its antero-approximal surface; the left lateral a still larger cavity involving the pulp. Fig. 1 represents the gap to be filled, with cavities prepared. The following device was constructed: A bar made of wire of the well-known platinum and iridium alloy, about No. 14 or 15 American gauge plate, was

*If my memory serves me, Bing, of Paris, was the first to suggest and perform this operation.—J. B. H.

bent at right angles; one arm tapered so as to occupy in part the pulp-canal of the lateral incisor. To the other end of the bar was soldered a small flat piece of the same alloy, forming a T. From its center, and on the side opposite to the tapered arm, was soldered a piece of the same wire. The soldering was all done with pure gold. This downward projecting piece had on it a screw-thread cut before it was attached to the cross-bar. Fig. 2 gives a good idea of the piece thus far. A small conical nut is fitted to this screw.

The appliance, thus far constructed, was loosely placed in position in the cavities which had been prepared for it, the screw pointing slightly backward to clear the porcelain tooth to be placed upon it. Fig. 3 represents the bar in position in the teeth. The end entering the central incisor was made T-shaped for greater security of anchorage. A small piece of platinum plate, quite thin, was cut to the proper shape; a hole punched in it sufficiently large to allow the

Fig. 1.

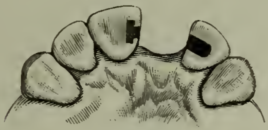


Fig. 2.

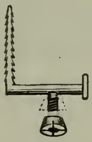


Fig. 3.

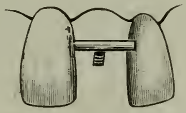


Fig. 4.

Fig. 5.

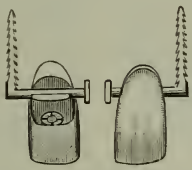
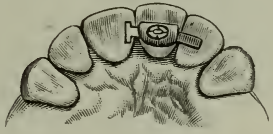


Fig. 6.



screw to pass, and this was adjusted to the bar with a burnisher, fitting the bar somewhat like a saddle, its anterior and posterior borders being of shape and length indicated by the case; the width governed by the space to be filled.

A plain plate cross-pin tooth was selected and ground, care being taken to cut away the back of the tooth above the pins so as to have plenty of room for the screw, which was determined by trial. The tooth was backed with thin platinum, and it and the saddle cemented with adhesive wax, and carefully tried on, to see that the little saddle exactly fitted the bar. The whole was now removed, invested, and soldered. The punched hole in the saddle indicated the position of the hole to be drilled, which was given the same pitch backward as the screw. Fig. 4 illustrates the tooth and backing after soldering. The hole for the screw was countersunk from without to receive the nut which was made to fit it. This device of screw-and-nut pivoting is the design of Dr. Bonwill, and may be found fully illustrated

on page 416 of vol. xxii., Dental Cosmos, of which invention the one under consideration is an outgrowth. The iridium alloy is better than gold for nut and screw, as it is tougher and holds the thread better. The nut has a crucial slot, and a suitable forked screw-driver can be made from a broken excavator. The countersink in the backing should be a little deeper than the size of the nut, and the recess filled after screwing up with zinc phosphate, which serves the double purpose of giving a smooth contoured surface and of steadying the nut in case of strain. If gold is preferred for the bar it may be used, or the appliance may be electro-plated.

The appliance put together, or "assembled," as the machinists say, is seen at Fig. 5, and placed in position in Fig. 6.

For the insertion of such a fixture, the rubber dam being adjusted, the cavities and root having been previously prepared, the bar and tooth are placed in position. Any of the cements may be used. Zinc phosphate is perhaps preferable, and the whole affair cemented in as if for permanent retention. The softness of the moderately slow-setting plastic cement gives time for perfect and accurate adjustment. When fully set the surplus cement is cut away, one side at a time, for the gold filling, the porcelain tooth meantime being removed by unscrewing the nut. This gives a freedom of access to the bar and to the cavities which allows easy manipulation of the gold, which may be solidly built around the cemented ends and into the anchorages, contouring to ideal. This operation completed, the rubber dam may be removed and the tooth tried on again, the articulation having been previously attended to. It is now screwed home to place. Slight alterations in the "pitch" may be made by cutting away the countersink front or back, though ordinarily this is not necessary. The groove in which rests the bar is usually tight-enough for practical uses, but if a fluid-tight joint is desired, it may be made with a thin layer of gutta-percha placed in the groove and the tooth warmed and screwed tight, and the surplus trimmed off after cooling. If gutta-percha is used it will necessitate a tightening of the screw the day after, as this material will slowly spread.

The work thus completed is strong, firmly anchored, admits of easy removal of the tooth in case of accident to the porcelain, and even repair of the fillings should not be beyond the skill of the well-trained dentist.

Four years' use of some of these appliances seem to justify the prediction of fair durability. In any and all cases the occlusion should be so slight as to spare the supplied tooth, as prudence suggests that no appliance should be put to undue strain, and this is more true of front than back teeth, as leverage is more dangerous than vertical pressure.

If it be desired this system may be applied to more extensive bridge-work, by prolonging the bar, and having as many screws as there are teeth to be supplied. The bar might be soldered to caps fitted to roots, and these caps cemented on as in the usual "Richmond crown" work, the advantage being that any tooth could be removed without disturbing the attachment to the roots. The fact that the entire piece has to be removed for repair of a single tooth is a serious drawback to the advantages of the ordinary bridge-work.

If it is preferred, the appliance may be held in with amalgam fillings. In this case an exceedingly thin copal varnish may be applied to the bar, to prevent possible softening of the gold-soldered joints of the bar.

A NEW BRIDGE DENTURE.

BY R. WALTER STARR, D.D.S., PHILADELPHIA, PA.

It will doubtless be admitted that in some cases bridge-work has advantages over the ordinary plates for partial dentures. It will also be conceded that the security and permanence of the fixture

FIG. 1.

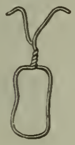


FIG. 2.

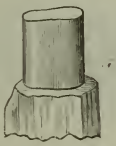


FIG. 3.

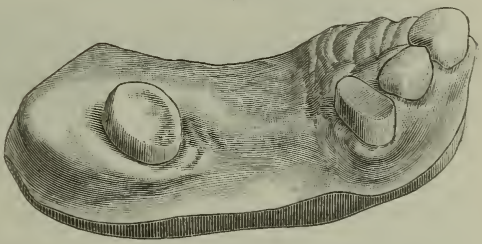
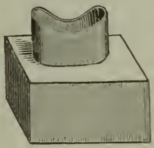


FIG. 4.

FIG. 5.



enhances its practical value to the patient so long as all goes well. But if for any reason it shall become necessary to remove the bridge, for repairs or treatment of the roots used as anchorage, its fixedness proves a serious objection.

In the endeavor to provide a remedy for this defect, the structures now to be described originated, and will, it is hoped, be found applicable in many instances in such cases as are typified by the accompanying illustrations.

In the construction of such bridges the first thing to be done is to grind with engine-corundums the overhanging edges and sides of the teeth which are to serve as abutments so that the crown-ends shall be slightly smaller but of the same shape as their necks. This can be demonstrated by bending a piece of fine binding-wire around the tooth-neck, and twisting the free ends together to form a close-fitting loop, which, if the tooth has been suitably shaped, may be

slipped from the tooth without changing the form of the loop, thus giving an exact outline of its form and size. Such a loop is shown in Fig. 1. The loop is then laid upon an anvil, and the squared end of a short piece of wood placed over the wire, and a blow struck to drive the loop into the wood as a guide in shaping the wood to the precise size and form of the inside of the loop, as in Fig. 2. The free end of this wooden mandrel must subsequently be slightly reduced so as to conform exactly to the natural crown. (These two figures were shown in a description by Dr. C. S. Case in the Dental Cosmos for February, 1885.) In lieu of this method an exact impression of the tooth may be taken in plaster to serve as a mandrel. About a sixteenth of an inch is then ground from the occluding cusps of the abutment teeth, and an impression taken of the teeth and surrounding parts, to obtain a model as shown in Fig. 3. A piece of gold plate, say 22-carat fine, number 30 gauge, is cut and fitted closely around the mandrel, and its ends soldered to make a collar as in Fig. 4. This is laid with the crown end upon a piece of lead, and a piece of wood or metal laid over it and struck with a hammer

Fig. 6.

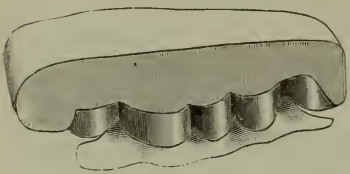


Fig. 7.

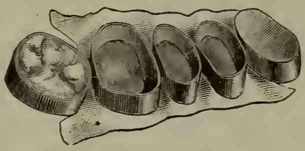
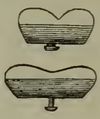


Fig. 8.



to drive the collar into the lead so as to hold it securely and maintain its form, while with a smooth, half-round file the neck end is shaped as seen in Fig. 5. The other end of the collar is then cut so that the depth of the collar shall a little exceed the visible length of the tooth, thus allowing the neck end when placed upon the tooth to pass beneath the free edge of the gum. A piece of gold plate, either plain or struck up in cusp form, is then soldered to the crown end of the collar. If a seamless collar is used it can be laid upon the plate for soldering without an investment or a clamping wire. A piece of thin platinum plate, number 36 gauge, a little wider than the space to be covered with the teeth, is fitted and burnished over the space between the abutment teeth, which have been so trimmed that the caps described will slide on and off easily. These caps are now cemented to the platinum plate, and collars made and fitted to properly fill the space between the abutment teeth. They are held in contact with each other and with the platinum plate by running melted white wax in and between them. The whole piece may then be transferred from the model to the mouth, and stiff mixed plaster and sand pressed into and over the collars and caps. When the

plaster has set the mass may be removed, trimmed, and the wax melted away with a result as shown in Fig. 6. The lines of contact of the collars with each other, with the caps, and with the plate are to be neatly soldered, when the investment may be removed, leaving the bridge as shown by Fig. 7. The free edges of the plate may then be trimmed to the margins of the collars or caps, and the whole denture polished. The bridge may now be slipped on and off the natural abutment teeth with just enough of friction to retain the denture in position and yet allow of its ready removal.

FIG. 9.

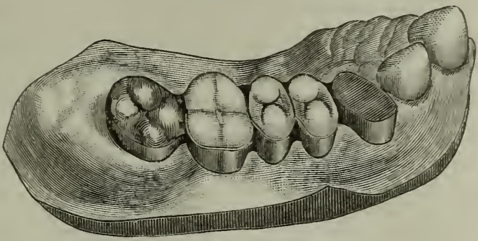
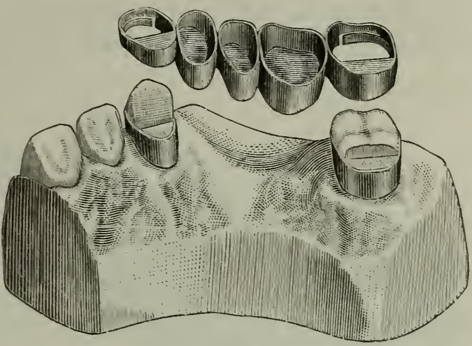


FIG. 10.



Suitable cusp-crowns (see Fig. 8) are now selected, the cups partly filled with wax, and the cusps placed in position. The denture is then tried in the mouth and the proper occlusion obtained by grinding or filing the edges of the cups. The piece is now to be thoroughly cleansed and dried; the cups nearly filled with insoluble cement, or hot gutta-percha; the cusp crowns set in the cups; the bridge put quickly in place, and the patient directed to firmly and repeatedly close the jaws to properly determine the occlusion. It will be found best to place a piece of paper the thickness of a postal card over the porcelain cusps when forcing the denture to place, so as to insure that they shall be a little short, and thus avoid irritation of the anchorage teeth in mastication. These anchorage teeth or roots will in time elongate and form a close occlusion.

When the cement is properly hardened the piece may be removed. A hole should now be drilled through the metal caps to allow escape of surplus filling material. A small quantity of gutta-percha thoroughly warmed should now be placed in the caps, and with a piece of card placed between them and the occluding teeth the caps should be forced home.

The completed case is represented in Fig. 9.

The bridge may at any time be removed with warmed forceps

beaks held long enough on the caps to soften the gutta-percha. The cusp crowns may be removed if desired by the same method and replaced without detaching the bridge.

A modified bridge is shown in Fig. 10. It will be observed that collars have been firmly fixed with cement or gutta-percha on the abutment teeth, which have their occluding surfaces ground flat on their inner aspects, so that the partial cap shown may thus prevent the telescoping collars from being forced too far down on the teeth. By means of a frame saw, a narrow tongue is cut on the outer face of each telescoping collar, the free portion serving as a spring clasp to hold the bridge securely on the abutment teeth, and still allow the removal of the piece whenever so desired. Fig. 11 shows such a bridge in place. It is obvious that if in this instance the roots only of the cuspid and second molar had been present, they could by means of the collar and cusp-crown devices have been put in shape to serve as abutment teeth for the telescoping bridge shown in Figs. 10 and

Fig. 11.

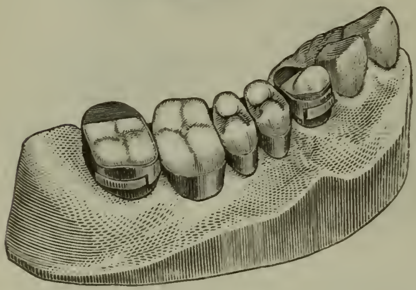


Fig. 12.

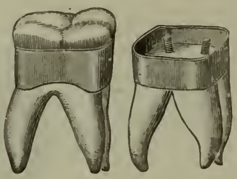


Fig. 13.

11. The second molar roots so crowned are seen in Fig. 12. When it is desirable to show the faces of the porcelains to a greater degree, the collars may be cut away on the buccal sides and the countersunk crowns be used as illustrated by Fig. 13. The platinum base may either rest broadly upon the gums or be sloped so that only the buccal border shall touch the gums, or it may be so shaped as to be entirely free from the gum. This is done by building upon the plaster cast, and bending the platinum plate and shaping the gold tubes to the surface so made, depending wholly for support on the abutment teeth or roots.

Briefly stated, the points of excellence in this bridge are strength, lightness, avoidance of liability to breakage of the porcelain in soldering, ease of construction and adaptation, and the facility with which it may be re-organized, or for any reason be removed and replaced. This last feature is of special value in the not infrequent event of subsequent alveolar abscess, for in cases such as are shown in Fig. 9 the bridge may be removed, the involved teeth drilled,

medicaments applied, the bridge replaced, and this process repeated without depriving the patient of the use of the denture.

SPREADING THE DENTAL ARCH.

BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

A FORM of dental irregularity very difficult to correct is found where the cuspids are situated near or in contact with the centrals, while the laterals stand inside of the arch, and when the jaws are closed pass behind the inferior incisors. If these laterals are in near relations to each other, it is by ordinary means well-nigh impossible to interact upon them with sufficient pressure to force them apart; the space being quite too short to admit a jack-screw.

Fig. 1 represents such a condition. The cut is made from the cast of a case in practice, the patient being a young woman eighteen years of age, who came under my care in 1883. The superior laterals were then only one-fourth of an inch apart, and closed behind the inferior

FIG. 1.

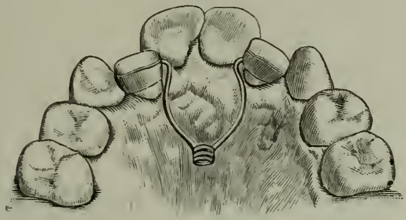


FIG. 2.

incisors. There were but small spaces between the superior centrals and cuspids.

Thin platinum collars were made to fit the laterals, on which, after drilling a hole in the side of each collar, they were firmly fixed with oxyphosphate of zinc. A Norton-Talbot spring was bent into the form shown by Fig. 2, the ends of the arms being turned at a sharp angle and cut short as seen in the figure.

The spring was then put in place, the arm ends entering the holes in the collars, and the curved arms found to be so closely conformed to the surface of the gums and palatine parts that the fixture was no obstruction to occlusion, and yet could be easily sprung out of position for cleansing purposes or for increasing the expansive power of the spring, by simply widening the lateral spread of the arms. Fig. 1 shows the progress made in four weeks' treatment. When the laterals had been moved past the sides of the centrals, they were by other means forced outward into line.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

(Meeting of January 12, 1886, continued from page 152.)

The President. Gentlemen, Dr. Lord has consented to say a few words on the subject of extracting.

Dr. Benjamin Lord then read the following paper entitled

Judicious Extracting.

Dr. Lord. It will be remembered that about three years ago we had a discussion in this society on extracting,—or rather on what was termed "judicious extracting."

I propose to offer a few thoughts to-night on the same subject, as I believe it to be a most important one in the general treatment and management of the teeth. Without going at all into a discussion of the primary cause or causes of decay, we will observe, first, that as a rule decay occurs on the approximal surfaces of teeth that are either crowded or situated very close together; while, on the other hand, if they stand isolated,—having natural spaces between them,—decay does not occur on those surfaces. It follows, then, that if the teeth can be so arranged or treated as to secure an isolated condition the spaces will be self-cleansing or readily cleansed, and decay will very rarely, if ever, take place.

Of course, no rule can be laid down that will apply to all or even to the majority of cases, as the conditions, as we find them, both natural and pathological, are varied and must govern our practice; but we may suppose or give cases that will, in a good degree, enable us to indicate the teeth that it would be most judicious to extract. For instance, a young lady of sixteen consulted me a few weeks since, and I found on examination that the bicuspids and sixth-year molars were decayed on one or both approximal surfaces, and the second or twelfth-year molars decayed—undoubtedly from defective formation—on the grinding, the buccal, and the posterior surfaces. This, to my mind, was a plain case which called for the extraction of the twelfth-year molars, both on account of their not being worth the effort to preserve them and for the greater security and certainty of the preservation of the remaining teeth. I considered the case one of the most favorable of all the conditions produced by decay,—indicating, as it did, the particular teeth to be extracted, as in my judgment the twelfth-year molars are the least important teeth, and so can best be spared.

It is not often that we can so certainly point to these teeth as the

ones to be selected for extraction, as we seldom find them more decayed than the sixth-year molars or the bicuspids. But when we do, I believe that we get the best results from extracting them, if the first molars and bicuspids can be preserved, as a continuous row is maintained, which is much better for mastication, and no opportunity is allowed for the tipping of the teeth.

Another case came to my attention recently,—that of a lady about twenty-six years old, who had thirty-two teeth with rather flat than oval contact surfaces,—just the shape of teeth most liable to decay,—and though not so crowded as to be irregular in the arch, before broken by decay they must have been very close together. The front teeth were sound, but most of the molars and bicuspids were decayed and filled. I don't think the teeth showed signs of decay particularly early, but during the last ten years they have received a great deal of attention at different places in this country and Europe. Much trouble and pain have been experienced; the pulp of one of the molars lost; and there is still much to be endured by both patient and dentist if the teeth are to be preserved. Now, to my mind, if extraction had been resorted to when the teeth began to decay, or even before, a sufficient number for mastication and the retention of the natural contour of the features could easily have been preserved through life, and the patient spared a great deal of time and suffering. In this case, if taken in time, the least important teeth could have been selected, as the front teeth were sound, and I should have decided upon the four second bicuspids. I would also have taken away the wisdom teeth if they promised to seriously interfere with the certainty of the preservation of the other molars. The removal of the second bicuspids would have relieved the molars from close contact, while the posterior approximal surface of the first bicuspids and the anterior approximal surface of the first molars would no longer be liable to decay, or if already decayed their preservation after being properly filled would be rendered sure.

This is not a fancy nor an extreme case, nor is it an unusual one to be met with in persons from sixteen to twenty years of age, and I believe if we were to extract judiciously, rather than try to preserve the whole set when there is so much liability to decay, we would in the end save more teeth, and with far less trouble and suffering to our patients.

The most of the cases that we meet with are not so plain or simple as those which have been instanced, and hence it is not so easy a matter to decide upon the teeth to be extracted. The extent of existing decay, as well as the crowded condition of the front teeth, will often aid us in deciding which of the bicuspids to remove, if both cannot certainly be kept. Better to show a little space from

the loss of the first bicuspid than to run the risk of losing them both.

The condition or extent of decay in the molars will also determine which one of them, if either, should be removed and both of the bicuspids kept. Again, the size of the arch will be a guide as to whether it will be judicious or necessary to extract at all; for in a large arch, all things being equal, all the teeth may be retained, whereas in a small one it might not be safe, except the teeth were of excellent structure.

We may also be governed more or less in our decision regarding the advisability of extracting by the shape of the teeth back of the cuspids, as the flat, square teeth are much more liable to decay on their approximal surfaces than the oval-shaped ones with smaller necks, which have so much less surface in contact. As an illustration of this, I may add that I operated for a lady last week between whose teeth at the necks I could put quite a strong instrument, though the gums were not receded, and a thin instrument would readily pass between the crowns at all points. The patient is over seventy, and has thirty-two teeth, yet I could not detect the least decay in the approximal surface of any of them. The shape or form had much to do with their preservation. This case, though an extreme one, illustrates that it is not always necessary or best to extract, and that a full and complete set may be retained.

Perhaps the most important guide in our consideration of the subject of extracting, as a means of prevention, and to assist in arresting existing decay, is the quality of the tooth-structure. Teeth that are hard and perfectly formed will bear to be in close contact, while those that are soft in structure are almost sure to decay on those surfaces.

Of course, no one would think of extracting the incisors or cuspids as a conservative measure, and the next that we would wish to keep for appearance are the first bicuspids. How often the first and second bicuspids are both lost after much effort to save them, and how much better it would be to save one with certainty, which we can generally do, than to risk the loss of both! I believe the sixth-year molars to be the most important teeth in the mouth, both as regards mastication and in their relation to the adjoining teeth, and as such they should command our highest interest and best efforts for their retention and permanent preservation if the pulps are not exposed or dead. They are in a great measure the keystone teeth, and the loss of them causes more tipping and shortening of the adjoining teeth than result from the loss of any others. But they very often decay early, and most unfortunately are far gone before the young patients come to us for attention. If it is not possible to

preserve the crowns of these teeth, I consider it the best practice to break away the frail portions of the same, to prevent the lodgment of food, and keep such roots as are healthy until the bicuspids and twelfth-year molars are fully erupted and the teeth of both jaws antagonize. The removal of these roots *then* will occasion less tipping of the twelfth-year molars, and consequently less masticating surface will be lost, and undue force and wear upon the front teeth will be prevented, though the teeth in the posterior part of the mouth will not entirely close up. In fact, I believe it best to retain healthy roots when they do not interfere with the preservation of surrounding teeth, as they support the jaw and the adjoining teeth in their natural positions. Such roots should also be retained for artificial crowns, and as a firmer base for plates, if such should be required.

Two other considerations, not unimportant, should influence us in advising extraction: First, the care which persons have learned to bestow upon their teeth; for those who do not spend sufficient time on their teeth to keep them clean on all their surfaces had better have fewer teeth. Less attention will be required, and more comfort will be experienced in the end. Second, the inability from any cause to have the teeth properly cared for by a skillful dentist.

It may be said that the art of dentistry proposes to preserve the teeth, not to destroy them; but how few persons have continuous rows of teeth at the age of thirty to forty! The question is, Will judicious extracting enable us to help our patients keep a greater number of their teeth into middle life and after?

I do not feel, Mr. President, that I have fully covered the ground or done justice to the subject, but if enough has been said to excite inquiry and provoke discussion, something at least has been accomplished.

The President. The discussion of the subject of Dr. Lord's paper will now be in order.

Discussion.

Dr. J. Smith Dodge, Jr. Mr. President, I would like to express a general assent to the tone of Dr. Lord's paper, although I do not agree with him in some minor points. It is my observation that there are exceedingly few mouths in which all the teeth are of the same or nearly the same quality. I find that my patients have often one or two pairs of poorer teeth. I frequently observe that, after a course of some years' acquaintance with the dentist (whether I have been the dentist or not), most of the work that the mouth has required can be located in spots about the mouth. Here have been the weak parts, the intervals containing stronger teeth. And when I remember how many mouths have come under my notice

where there were a good many that might be called solitary teeth, standing with no contact except when meeting in antagonism, and have seen the general wholesomeness of such mouths, it long ago impressed me with the idea that, on the whole, when the weak spot is recognized in a set of teeth, unless there are circumstances which positively prohibit, it is to be seriously considered whether it is not better to give up certain teeth, with the belief that the whole mouth will be improved thereby, than to try to save them. Dr. Lord's paper contains a sentiment which he does not present as his own, but which is often put forward—that it is the business of dentistry to save teeth. I like to take every opportunity to denounce that sentiment. It is just as much the business of the dentist to extract the teeth that ought to come out as it is to save the teeth that ought to be saved. It is the business of dentistry to give to mankind the largest amount of use and comfort from their dental organs. If that means the loss of some of those organs, then it is the business of dentistry to see that they are lost. When that means, as it usually does, the preservation of the teeth, then it is the business of dentistry to preserve them. But I believe that a great deal of mischief is done by not having this matter clearly in mind. There has been some very wild talk about the criminality of extracting teeth. I somehow do not read as much of that as I used to. I do not think it is emphasized quite so much as it was; but I believe that the dentist who, as Dr. Clowes has put it, is not prejudiced beyond all reason will find in his own experience multitudes of mouths which are decidedly better after having, at a rather early period of life, lost some of their teeth. It is not a week since I caused to be extracted from a mouth for the welfare of which I have the utmost solicitude two upper second bicuspids, and when I made a careful inspection of the remaining teeth it struck me as a most forcible instance of the doctrine of weak spots. Here were two teeth which had received the greatest attention for a number of years, and the history of which had been one of constant giving way, and of frequent painfulness to the patient, till they had come at last to be largely scooped out on both approximal surfaces, with a very strong indication that the sulcus between the two cusps would also need a filling soon. So I said to myself, these teeth shall go. There was not in all the rest of the mouth another tooth that presented at all the aspect which these two mates showed me. The others had some little fillings, almost every one of which was giving an excellent account of itself, but there was not a tooth in the mouth when these were gone that had ever required to be largely filled. To have filled these two teeth would have been a capital operation of the most difficult kind, requiring almost as much gold as there was natural crown

remaining. They were weak spots, and I look forward to congratulating myself in coming years when I see that mouth, with the pressure taken off the other teeth and everything adjusting itself to a new condition, and remember what the patient had been spared and see what has been gained by the removal of these teeth. I have no particular or favorite teeth which I try to hold on to, nor any which are always the proper ones to come out. The teeth which need to come out are the ones which I take out, and the teeth which had better be preserved are the ones which I keep in. Of course appearance will count, and loss of antagonism will count, in making up one's mind about sacrificing teeth; but I very much discredit the idea that you can name any particular teeth which, as a rule, will be the ones to be lost if any are. I find no such suggestion in nature, and I find that the gentlemen who have favorite teeth for extraction have each his own. Nobody advocates removing the six front teeth, but there is not another tooth in the mouth besides these that somebody does not tell you is the tooth to take out; and as they are all honorable men, and skilled in their profession, it seems to show that there is no such tooth, but that the tooth to take out is the one that ought to be lost.

Dr. Lord. I may state a case of a new patient of mine, a physician of this city, whose age I should say was about thirty-six. In the superior jaw, right side, the effort to save all the teeth has evidently been made. The wisdom tooth is nearly gone, and was never worth the filling or trying to keep. The molars, first and second, are good; the bicuspids may both be said to be wrecks; the incisors and cuspids all badly decayed, having been filled and refilled. On the left side the sixth-year molar was taken out in time, which gave the bicuspids more room, and they are sound, as is also the twelfth-year molar. Probably there never had been any wisdom-tooth on that side. In the inferior jaw the wisdom-teeth only of all the molars were remaining, and they had large fillings on the anterior approximal surfaces. The second bicuspids were both filled on the posterior approximal surfaces, one of them being pulpless. The molars had been filled from time to time before they were extracted. Now, is not the wisdom and benefit of extracting well illustrated by the result of it on the left side of the superior jaw?

Dr. Clowes. If all the sixth-year molars had been taken out at the proper time, he would have had a splendid set of teeth.

Dr. Kingsley. I beg the indulgence of the society for a few moments in referring to my remarks made at the October meeting upon some of the cases presented to us by Dr. Wyeth. Some of my timid friends in the society thought I was too severe, but I answered that "there was nothing personal in the matter; it was purely a

question of science, and science knows neither persons nor friends. It must not go out that the Odontological Society witnessed such practices without protesting." I have received a number of letters of approval from various parts of the country of my remarks that night, and I should like to read one which I received to-day from Professor Ludwig Hollaender, of Halle, Germany:

SUNDAY, 20th December, 1885.

MY DEAR DR. KINGSLEY: As the December number of the DENTAL COSMOS came in to-day, I had plenty of time to read and enjoy your most pertinent remarks on the lecture of Dr. Wyeth.

How can a surgeon who pretends to operate on cleft palate pronounce that he has not troubled himself as yet about the mechanism of speech? If such men as these, who are merely mechanical surgeons, are welcomed to speak in a dental society, and are allowed to pronounce such balderdash, I am sorry to say I have no great opinion of his audience.

But not alone his cases of cleft-palate, but also his other cases, proved that he has no idea of the surgery of the mouth and the face. How could he, to be able to open the antrum, make an incision from the corner of the mouth to the angle of the jaw? That is downright barbarism. I have treated at least twenty cases of different diseases of the antrum, but in all of them I was able to make an opening from inside the mouth above the second bicuspid or the first molar.

Case VI is also a piece of downright cruelty. No surgeon in Germany would split the lip through the median line to remove a tumor from the anterior part of the alveolus. He could easily remove the tumor and take away part of the alveolus and the bone without lacerating the lip,—an operation which I have done myself several times with the best result.

All his cases prove that he works with his fingers and instruments and not with his brains. I wish you had censured him a little stronger, for I consider that he deserved it. Very truly yours, L. HOLLAENDER.

The President. We will now have the pleasure of hearing Dr. Howland give a description of an artificial crown.

Samuel F. Howland, D.D.S., then read a paper entitled

ARTIFICIAL CROWNS.

Dr. Howland. To a thinking and philosophic mind there is nothing more interesting than to watch the progress of events; the development in the arts and sciences; the increase of knowledge in the professions; the better education of the masses to an understanding of their own duties and an appreciation of the efforts of a profession in their behalf.

The science of dentistry is progressive; and when we look back thirty years or more and see what it then was, and now behold what it is, there is cause for congratulation that so much has been overcome and so much achieved. And yet all this enables us to see how much more there is to be accomplished and what a mine of knowl-

edge there is yet to be opened by thought, study, and experience. The primal object of the dentist is to aid in preserving the natural teeth of his patients to their normal uses of mastication, speech, and adornment. This is a coöperative work, for the patient has duties to perform as well as the operator, and should be educated to the thorough and proper care of the teeth.

It is a satisfaction to control a patient and be able to care for his teeth from an early to an adult age; but there are many people beyond our reach, who rove about the world, employing such dentists as are convenient, if any at all, and in consequence often suffer and lose much which can never be regained. In such we see nearly every day a track of devastation which is truly lamentable. We judge of the character of teeth lost by those that remain. The saddest and most painful contemplation of the dentist is these *unnecessary and irreparable losses.* In daily practice many teeth are seen with devitalized pulps and crownless. Many of these may be preserved and restored to usefulness by being crowned, and a result may be reached that from looks and feeling approximates very nearly the natural teeth.

The best method of crowning roots of teeth is the subject for our consideration. For a long period there seemed to be but one general method of crowning roots (commonly denominated pivoting teeth), and that was by setting a porcelain crown to the root by a wooden dowell. This operation, in its results, was sightly, but unserviceable and not durable; and for this method there was no provision of crowns save for the six upper front teeth.

Of the numerous methods of crowning roots, I will mention two which have been quite popular and generally used, each possessing much merit. One of these methods was introduced several years ago, its most important feature being a banding of the root for security, and as a preventive of the root splitting. This crown was made entirely of gold for the back teeth, having a porcelain face when used for the front teeth, and is handsome, serviceable, and durable. Its application with a porcelain face is complicated, and the operation incident thereto is sometimes tedious to both patient and operator.

Driving a gold band on the root of a tooth, and forcing the gum from its neck when it is firmly attached, is so painful that many patients will not submit to it, and experience shows the operation to be of questionable propriety because of the bad results which often follow. Yet on a root that is liable to split a band is valuable.

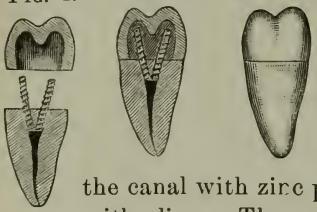
Another popular crown in general use is the Bonwill crown. This has much merit; is simple in its application, and is probably used more than any other. In setting this crown but one pin can be

used, whereas many roots will allow the use of two or more pins advantageously with a crown adapted to the purpose. On account of the opening which passes entirely through this crown, it is weak and liable to break. This is its chief defect.

In speaking of these two methods of crowning roots, there is no wish or intent to disparage either of them, but merely to point out some of their defects, with the wish and hope of overcoming them. In crowning a root our effort is to restore a lost part, and the more closely we follow nature the better is our success. The principal requisites for a crown are *strength*, *durability*, *simplicity*, and *naturalness*, with no metal in sight.

Several years ago I felt the need of a crown different from any in use, and had one made to follow as nearly as possible my ideas of what a crown should be. It is simply a hollow porcelain crown, with an opening of dimensions to admit one or more pins (according to the kind of tooth) to a secure depth, yet not so large as to unduly impair the strength of the crown (Fig. 1). The method of setting this crown is to shorten the root even with the gum with a stump file; fit the crown to the root; enlarge the root-canal so that a threaded pin of proper size will pass in easily, partially filling the canal with zinc phosphate, and press the pin to its place with pliers. The crown should then be filled with zinc phosphate, and pressed to its place, care being taken to hold it in position until the cement sets (Fig. 2). If any operator distrusts the ability of zinc phosphate to make a perfect joint between the crown and root, a small quantity of silver amalgam or gutta-percha can be used to advantage.

FIG. 1. FIG. 2. FIG. 3.



This crown is strong, and during its test of several years none have broken so far as known. The mode of fastening is strong, and has the advantage of two pins when set on a bicuspid having two pulp-canals. It is simple, and when set—no metal being in sight—it imitates nature as well as art is able to (Fig. 3).

The use of and experience with this crown affords the belief that it has some qualities not belonging to other crowns, and fulfills in a good degree the aforenamed requisites. It is offered for your criticism and use with the only motive of supplying a want and a necessity for something better than we have hitherto used for crowning roots of teeth.

Discussion.

Dr. Allan. I would like to ask Dr. Howland if this crown can be obtained at the dental depots.

Dr. Howland. They have not been put on the market. The S. S. White Company said that if there was a demand they would make them.

Dr. Allan. I think that in most respects they are decidedly superior to the Bonwill crown. Judging from the specimens here, they will be much less trouble to set, and will hold more firmly.

Dr. S. E. Davenport. I would like to say a few words in regard to the adaptability of the Howland crown, which I value highly, and I am sure that if it had been introduced earlier as it has been to-night the S. S. White Company would not have had occasion to regret a lack of demand. The cavity inside of the crown is so shaped that it enters the interior of the cusps, making really a dove-tail opening, and without interfering with the strength of the crown. It is very strong, is easily applied, and when in position it is exceedingly natural, no metal being in sight. It can be set with either gutta-percha or zinc phosphate. I wish to commend Dr. Howland for producing this crown, and to thank him for presenting it to us this evening.

Dr. Dodge. I hope these crowns will be furnished to us. As soon as I saw this specimen I felt as though it was an old acquaintance, although I never saw this one before, because it adapts to bicuspids and molars a principle that I have for several years been using upon the front teeth. I am setting the old-fashioned pivot tooth on a gold wire cemented with zinc phosphate. It is so strongly fastened that in one case the wire, not being large enough, was broken in the middle, leaving one piece cemented into the root and the other in the crown, and the process of getting that piece out of the crown, with no prominent part to get hold of, convinced me that the attachment was amply strong and sufficient. In one case I had applied a similar fixture by fitting over the end of the bicuspid a little plate with a wire on it, which was inserted in the root with zinc phosphate, in the same way, two years ago. A few days since the patient came in with the porcelain part broken off. I had hard work to get that gold pin out of the root, and was certain that if I could have grasped the gold with a pair of forceps I could have extracted the root. It was simply impossible to get it loose, and I had finally to cut under, so as to lay bare the cement surrounding the pin. This brought to sight again the end of the root, which had been for two years covered with a plate of gold set in zinc phosphate, and in a mouth where everything decays that can decay. And when I had accomplished that, after an hour's work, I asked my father to come and look at it. I said, "I wish you would look at that root and see how long you think it is since it was filed down." After a careful inspection of it, he said, "Well, it looks as if it had just been filed down." And so it

did. There was no change of color, and the very file marks were not obliterated. I said to myself that that joint was tight enough. The old-fashioned pivot tooth, set on the root of a front tooth with zinc phosphate and a gold or platinum wire, with this cement joint,—that is the kind of tooth-crown I have pinned my faith to. I have had them in use nearly three years, and they do not show any sign of budging. This contrivance presented by Dr. Howland is precisely the same thing adapted to bicuspids. I want some of them right off; and I believe that every man who will try them will want some more. If the S. S. White Company hesitate about making them, I think they make a mistake, and they had better begin to manufacture them to-morrow.

Dr. La Roche. Will the doctor please tell what kind of phosphate of zinc he uses? I find it degenerates under the gum-tissue.

Dr. Dodge. I use that made by Dr. Smith, of New Haven.

Dr. Dwinelle. I was going to ask that question. We know there are oxyphosphates and oxyphosphates; there is a great difference between them. They are all insoluble, all as hard as agate, all enduring; and nine-tenths of them are not much better than chalk and water. Sometimes the same article will be good, or bad, or indifferent, according as you vary your treatment of it.

Dr. Dodge. That is an unfortunate expression,—oxyphosphate. You might just as well talk about oxysulphate of copper. It is simply zinc phosphate. I have tried four or five kinds, finding them more or less good, and finally I have settled down to the use of the one which I have purchased of Dr. Smith, of New Haven. I do not know but there may be a dozen others just as good in the market. In my experience cements that are soluble in some mouths are in others remarkably insoluble. But when the cement in the joint is no thicker, perhaps, than a thin card, or a sheet of writing-paper,—when such an edge is all the surface that is presented to the solvent fluids of the mouth, and when this substance is seen to resist those solvent fluids for two or three years under very adverse conditions,—I think you can reasonably look for considerable permanence and durability in a joint of this kind. There is not surface enough exposed for the solvents to make very much of an attack upon it. At any rate, I find that this material worked in a proper manner is a very reliable and durable thing. It will do about what you ought to expect it to do, and I consider it one of the great boons of recent dentistry.

Dr. Kingsley. Have you found any difference in different lots of cement which you have purchased from Dr. Smith? Sometimes a material which you find good at one time will subsequently be found to have deteriorated. I ask whether your various purchases have

been uniform in quality, and the same purchase uniform throughout the whole mass?

Dr. Dodge. I have not observed any marked difference; the dealers say you must have it fresh. Dr. Flagg puts a notice in his packages that after two or three months the cement deteriorates; yet I had a box that I found was dated four or five months previous to the time I purchased it. I think I was not quite fairly dealt with in that case. But I have found so little difference in the New Haven preparation that, finding two bottles of the powder will go considerably farther than one bottle of the liquid, I take a bottle of powder and a bottle of liquid, and whichever gives out first I replace. If this is looked upon as a substitute for gold fillings, that is absurd; but it is a capital thing for confessedly temporary fillings. It can be depended on for two or three years. About that time it will probably want revising. But when you cover it up in a joint between two impenetrable surfaces, with but a very thin edge of it exposed, I do not believe it will fail in a much longer time.

Dr. Dwinelle. The crown that Dr. Howland has presented I have just now examined, and I take great plesure in saying that I think it is a great success and a very important one. As Dr. Dodge suggests, it involves more or less the same principles that have been in use heretofore. It is well known that two pivots or screws placed at a little distance from each other are much stronger and will hold two substances or articles in place much more securely than a single pivot of twice or three times their diameter. I think that in many respects this crown of Dr. Howland's is one of the best that I have ever seen. The remarks of Dr. Dodge, with reference to the joint where the two surfaces are cemented being as thin as fine paper, apply admirably to this; the joint being so very close, the cement is protected from outside influences.

Dr. John B. Rich. In making experiments with different cements, I have found that their durability varied very much when mixed in different ways; and of different mixtures from the same bottle, one would be almost as hard as agate, while another would be granular, and without any strength at all. A proper formula should accompany each variety of cement, explaining fully the manner in which it should be mixed, and the proportions, as much depends upon a proper understanding of the material. That may account in a measure for the seeming variation in different lots from the same maker, although I believe they do not always make their goods alike; in fact, I have heard them acknowledge that. This material comes from a very hard stone, like calcareous slag, and is very difficult to grind; if it is not perfectly ground, it will not make a good cement.

Dr. Littig. Much depends upon the mouth into which you put the material. Some substances that will last a dozen years in one mouth will not last a year in another. I remember placing a bit of porcelain in a gentleman's front tooth seven years ago, expecting it to last only a few weeks, until I should be able to drill in further and replace it with a permanent filling; but to my surprise it remains there to-day, set with Fletcher's oxyphosphate. For years I have not been able to get cement of any other make equal to it, or any of the same cement that was as good as what I had at that time. So I think the difference is more in the mouth than in the substance. I remember having set five or six pivot teeth in one mouth with Dawson's oxyphosphate, five years ago, where the roots were very far gone, and yet up to the present time none of them have been lost. They were set by Dr. Darby's method,—a platinum cap and gold pin. Those I have set by other methods have come loose in less than a year's time. So I attribute it altogether to the character of the mouth and its secretions.

Dr. La Roche. Some time ago Dr. Howe spoke about using steel pins set in amalgam in crowning roots. I would like to ask him if he has since seen any of those set, and, if so, whether they have proved satisfactory?

Dr. Howe. The steel pin will discolor the teeth. Dr. Clowes gave me a hint about that before I had discovered it. When I discovered that objection I immediately stopped using them. I found them successful in other respects, and I have some crowns in use now set with a steel screw in the root.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular meeting, Tuesday evening, January 5, 1886, in the rooms of The S. S. White Dental Manufacturing Company, Broadway and Thirty-second street.

The president, Dr. William Carr, in the chair.

Dr. C. F. W. Bödecker, chairman of the Clinic Committee, reported as follows:

Mr. President and Gentlemen: We have had a large and interesting clinic to-day. Dr. Genese, of Baltimore, showed a new body for continuous-gum, which he claims is far superior to the old body that has been in use and known as Allen's body. The advantages claimed,

as I understood, are that there is no shrinkage in baking, and that very thin edges of it can be produced, like sectional gum blocks for rubber or metal work; therefore, sections for special cases can be very easily made. Dr. Genese also exhibited a new articulator; also, a new form of short-bite teeth. These teeth differ from ordinary rubber teeth in so far that they are hollowed out from below, especially in the places corresponding to the cusps, and those places are connected by a groove, into which the rubber goes and holds the tooth very firmly. He also exhibited a model of a very large osteoma of the upper jaw; also, a new piece of movable bridge-work upon a model. Mr. L. Morse, of Brooklyn, exhibited a new storage battery and electric motor, called the Diehl motor. Whether they are important improvements upon the old or not, I am unable to state. Dr. Brauneis, of New York City, filled some teeth, out of the mouth, with a new form of gold, which looks something like crystal gold, except that it is not quite as bright, but of a dark-brownish color. It is very much harder and more compact than any of the forms of crystal gold, and yet in condensing it works about equally soft. It is very readily condensed, and when condensed is extremely hard.

Dr. J. F. P. Hodson. Do you know how it is made?

Dr. Bödecker. No. Dr. Brauneis did not speak of the process of manufacture. When condensed it is so hard that a file will hardly touch it in finishing. I have tried it myself. It requires a new and quite coarse file to remove the superfluous gold. When condensed by hand-pressure the gold is very dense, as those who saw it can testify.

Dr. Atkinson. Do you mean dense or hard?

Dr. Bödecker. Dense and hard.

Dr. Atkinson. How do you know it was dense?

Dr. Bödecker. Because there were no pores visible, even when examined with the magnifier. The hardness I judged from the resistance it gave to the file.

Dr. Atkinson. You had no means of testing the density there.

Dr. Bödecker. Of course, from inserting a few pieces in a tooth, I can say but very little about it, but as far as my observation of it at the clinic goes, I believe this form of gold possesses some advantages, and if the adaptation to the wall of the cavity is what I expect it will be, it will probably have a future.

Dr. Hodson. Dr. Watts made that kind of gold twenty-five years ago. It was tried, and long since abandoned. I am inclined to think that this gold is made after the original method of Dr. Watts.

Dr. Bödecker. A jeweler, in experimenting for something else, accidentally obtained this form of gold. He says it is chemically

pure. The method of manufacture may be old; I do not know. I should say that for grinding surfaces, or any surface where there is much wear, this gold could be used with advantage.

Dr. F. H. Lee exhibited a very nicely-constructed new gas blow-pipe; and Dr. George E. Adams showed two pairs of models of irregularity, which I have here, representing the mouth before the regulating apparatus (Coffin's method) was applied, and after the plate had been worn for one month. Dr. C. S. Wardwell exhibited a model of a case of irregularity where a lower bicuspid erupted inside the arch. Being unable to extract it with the ordinary instruments, he had a special pair of forceps made for the purpose of removing it, which he also exhibited. Dr. C. S. W. Baldwin showed a new form of wax lamp, having a little tray upon which to melt the wax, obviating the necessity of holding the wax or spatula over the alcohol flame. It can be melted to any desired consistence, and then, by means of a spatula, carried to the desired place on the model or cast. Dr. R. J. Verplanck, of Albany, exhibited an appliance for cutting down roots of teeth when the canal is open. Upon the apparatus there is a center-pin which is put into the canal, giving the bur the necessary hold. You can then turn the bur to any place desired, and cut the roots off almost square, which is difficult or almost impossible to do with other root files. Dr. Verplanck also exhibited a nice little appliance for keeping the rubber-dam out of the way of the operator while filling.

President Carr. We now invite your attention to the first paper of the evening, by Professor S. H. Guilford, of Philadelphia, the subject being "The Band Matrix and its Uses."*

President Carr. This paper is now open for discussion.

Discussion.

Dr. Guilford. I stated in the paper that these matrices were to be used in connection with gold filling. I should have stated that I use them just the same in connection with amalgam, or any of the plastics. Of course, they are of just the same service in connection with plastic fillings that they would be with gold.

Dr. J. S. Latimer. Have you tried phosphor-bronze, or any other metal besides steel, for this purpose?

Dr. Guilford. I have. My first matrices where all made of phosphor-bronze. I did not think it strong enough for the clamp, but it is quite good enough for the band. For turning the screw I used simply a little watch-key that fitted it, and which was fastened to one of the S. S. White handles.

* See the DENTAL COSMOS for March, 1886, page 138.

Dr. J. S. Latimer. I have been using some form of matrix for the last few months more than ever before, and to some extent for two or three years. Lately, for filling very soft, chalky teeth, that seemed bound to go whatever filling you adopt, I have been experimenting with copper amalgam, placing a small portion of it next to their cervical margins and against the lateral walls where decay is most likely to begin, and then finishing the fillings with other amalgams which hold their color; and, so far as I can judge, it seems to answer a very good purpose. Whether copper amalgam will prevent the recurrence of decay or not, I do not yet know.

President Carr. Dr. Atkinson, have you used matrices in your practice?

Dr. W. H. Atkinson. I have never used the matrix enough to admire it at all; and I had better not say anything on the subject, as I do not wish to throw cold water on what other men think very valuable. I have no use for a matrix, not once in twenty times when I fill a tooth, further than the matrix that will be necessarily formed by a properly placed wedge.

Dr. J. F. P. Hodson. I have used the matrix a good deal in the past six months, and have found much comfort in its employment. I formerly used little matrices that I made myself from ribbon-saws. I have used Dr. Jack's matrices somewhat, and I found the very objection connected with them that Dr. Guilford speaks of, viz., the necessity of having adjoining teeth. I am interested in this subject, and I would like to hear some expression of opinion in regard to it.

Dr. F. Y. Clark. I fully agree with Dr. Atkinson that not more than one time in twenty is it necessary to use a matrix, but when that one time comes the value of the matrix is untold. I have cases where I could not succeed in any other way than by the use of the matrix. I am very glad to see the improvement in matrices that has been brought before us to-night. I have but one objection to them, and that is the color. Steel being dark, would not give a good reflection. I have been using platinum, cut in strips, passing it around the tooth, the ends meeting on the buccal surface. After fitting it around the tooth, I remove the piece and strengthen the ends by soldering another piece of platinum over them, and having punched or drilled two small holes through them, put it back on the tooth, run a piece of platinum wire through the holes and twist it with pliers until the band is sufficiently tight. In that way I get a very good matrix, and also have a better reflection than that given by steel. Platinum does not absorb the light as much as steel does. In order to get more strength on the palatal and the buccal surfaces I would sometimes use a wedge and hard oxyphosphate. I shall try this matrix of Dr. Guilford's. I think it is the best I have seen.

Dr. Guilford. The steel matrices can be nickel-plated.

Dr. Clark. That will overcome my objection.

President Carr. We will now invite your attention to the second essayist of the evening, Professor M. Whilldin Foster, of Baltimore, whose subject is

Abnormal Conditions of the Antrum, and Restorative Treatment.

Dr. Foster. Mr. President and Gentlemen: The subject selected for this evening, "The Abnormal Conditions of the Antrum, and Restorative Treatment," is presented for your consideration more especially to call attention to a diseased condition often existing within these cavities, and not infrequently overlooked by those in charge, and ofttimes referred by patients to other locations; and in the further expectation that the discussion which may follow will root out the obsolete practices, and present a clean front of the latest and most approved methods of treatment of the various diseases to which these important sinuses are liable,—not only the surgical operations necessary and the artificial appliances required, but also the therapeutical remedies employed for a complete restoration to normality.

Prof. Holmes (Vol. IV, A) says: "The Antral cavities may extend so as to be in immediate relation to *all* the teeth of the true maxilla, from the canine to the dens sapientiæ, or it may be contracted to such narrow limits as only to correspond with two or three of the central ones." The latter clause is more nearly correct, the exceptions being of very rare occurrence.

Heath says they "are frequently of unequal size and conformation in the same skull, of which specimen number one is a fair illustration. These variations are seldom mentioned in text-books, and are of importance as a guide to the limits of the antral walls in the necessary operations of entrance."

Prof. Handy says: "The antral cavities are lined by the pituitary membrane of the nose. Its opening in the natural skeleton is much contracted by the ethmoid and lachrymal above and in front, and the inferior and spongy below, and the palate bone behind."

"This opening," says Mr. Nasmyth, "presents much variety, both in direction and position, being sometimes in the anterior and sometimes in the posterior portion of the nasal process. It is stated to be about the size of a crow-quill."

The antrum has its cavity sometimes divided by septa into cells. The opening into the antrum communicates by one or two small oblique orifices with the middle meatus of the nose, and anterior to

it is the funnel-shaped tube, the infundibulum, connecting with the frontal sinus and anterior ethmoid cells.

Prof. Barker: "Besides its periosteal lining, its Schneiderian membrane has distributed upon it important nerves and vessels, it also being studded with many mucous follicles, which pass obliquely into it, some of them being arranged in rows."

Prof. Otto, of Berlin, says: "Occasionally a root or roots of the first molar tooth (rarely any other) extend into the cavity, free of any bony covering, and merely overlaid by the mucous membrane lining the sinus. A skull which I have here shows the root of a molar penetrating the floor of the antrum.

"To each organ is assigned a particular and important function. When one organ becomes diseased, it is a law of nature that those contiguous to it must suffer to a greater or less extent in proportion to the injury inflicted. When we consider the intimate relations existing between the teeth and antrum (only a thin partition of bone separating them), and the connections existing between the antral cavities and the frontal sinuses above and the sphenoidal and ethmoidal in the rear of this organ, it suggests to the diagnostician that, while the antral cavities are more likely to become diseased, from their proximity to the exciting cause, the others may and ofttimes do from the inflammation extending through the lining membrane possessed alike by each cavity, and of the same nature and character in all."

Dr. J. F. Caldwell says: "The agency of the membrane lining these several cavities is evidently to secrete a *mucous* fluid, necessary to moisten or lubricate the portion of it which covers the internal surface of the nostrils. In proof of this, whenever their pituitary membrane is not properly supplied, or is deprived of mucus, the sense of smelling is lost, and consequently these sinuses are so wisely arranged in situation that, whatever natural position the head or body may be placed in, the mucus will be poured out and supplied to the Schneiderian membrane of the nose by some of them. If the head be erect, the frontal; if resting on the face, the ethmoidal and sphenoidal sinuses, and if on either side, one of the antra discharges this mucus. Thus, while some are giving the supply necessary, the others are collecting in preparation to give it whenever requisition is made on them."

The antral cavities also aid in giving vibration, reverberation, and tone or modulation to the voice, and any impairment of the lining membrane of sufficient intensity to obstruct the opening into the nostril at once directs attention to a changed condition in vocal sounds.

Bond says: "The abnormal conditions of the antrum may be

enumerated as mucous engorgement, inflammation of the lining membrane, suppuration, caries, necrosis, and other morbid conditions of its walls; polypi and other tumors, and the presence of foreign bodies in the cavity."

The first, the most frequent and more innocent, cause of discomfort is mucous engorgement of the antrum. If from any cause the opening into the nostril becomes closed, the secretion from the lining membrane, no longer able to relieve itself by evaporation, accumulates in the cavity, its retention causing degeneration and consequent irritation, this irritation causing an increased secretion until the cavity becomes filled, and distention of the antral wall commences. Up to this time but little annoyance from pain has been experienced; the patient's attention having been drawn to a fullness about the parts, a sense of weight, a feeling as if a fluid was present on changing the head from side to side, and especially noticeable on throwing the head suddenly forward and downward. If no accidental opening occurs for the discharge of the retained mucus, the walls of the cavity are distended in all directions, showing the greatest protrusion at the point least resistant, whether it be in the roof of the mouth or externally beneath the orbit, and if an opening is not at once made for relief and exit of the fluid, the walls of the cavity will be perforated or broken apart at the least resistant point, and the fluid contents evacuated in that way. Should the engorgement have progressed to the extent just described before the case was present for treatment, it will be necessary at once to form an artificial opening; for should this be delayed, sloughing and exfoliation of the parts may follow. The most approved points of entrance to the antrum, either for mucous engorgement or other diseases requiring this operation, is through the apex of either the first or second molar, as at that point the antrum has the greatest depression. Should these teeth be free from disease at the roots, and sound, then the next best point would be the bicuspids, if unsound. Should all the teeth on the side affected prove sound and free from any irritating cause, then the perforation should be made between the roots of the first and second molars on the buccal surface of the jaw. Jourdain, a French surgeon, recommends that the entrance be made into the antrum through the natural opening. The difficulties of this operation were so great an obstacle to its successful accomplishment that it is now obsolete. Should the perforation be determined to take place through the cavity of one of the roots of the extracted tooth, it is readily and easily accomplished by passing a straight trocar from one-eighth to three-eighths of an inch in diameter by a rotary motion into the antrum. A caution is given by authorities to avoid the sudden entrance and the chance of wounding the opposite wall of the cavity.

This can be entirely avoided by using the appliance which is now presented for your inspection, consisting, as you observe, of a shield through which a thread is cut corresponding with the thread on the trocar. The trocar being rotated by the dental engine, gives a safe and speedy entrance into the antrum at whatever point may be selected. After the evacuation of the cavity of its contents, the therapeutical remedies which follow may be either very strong or very mild preparations of the agent selected,—preferably mild ones at the commencement, as the injections of tepid water alone have frequently proved beneficial. Many writers advise from one-half to one grain of the selected remedy to an ounce of water; others ten to fifteen grains to an ounce of water. The medicaments may be nitrate of silver, sulphate of zinc, chloride of zinc, acetate of lead, carbolic acid, creasote, permanganate of potash, or the more bland astringents,—green tea, port wine, alum, or some mucilaginous fluid, to which may be added a few drops of laudanum. Thymol and myrtol are sometimes used in the form of spray.

Prof. Barker said in this connection: "For this condition of the maxillary sinus, however, astringents seem to be particularly adapted, as they act upon the lining membrane in two or three ways. By union with the tissues they condense and consolidate them, thus preventing the secretions from passing through the membrane as readily, and by union with certain constituents of the blood, favor a cessation or diminution of the discharge."

It is better practice to test the contents of the antral discharge by placing it in a glass partially filled with water. The pus will sink and the mucus float, and in proportion, so is the treatment. Strong stimulants are contra-indicated when pus is not present in quantity.

Of the remedies mentioned, the permanganate of potash has yielded the most satisfactory results in those cases under my own observation; and on consultation with others who have used this medicament, they also indorse it as one of the most important remedies for this special disease of the antrum.

Inflammation of the lining membrane of the antrum is frequently a sequence of its mucous engorgement, the fluid being retained a sufficient time, undergoing degeneration, causing irritation and inflammation. Most writers attribute inflammation of the sinus to blows upon the cheek of sufficient force to fracture the walls; to a depraved condition of the blood either from syphilitic taint or scrofulous diathesis; to foreign substances within the cavity, etc. While any of the above causes may be and often are factors, the more frequent cause is some diseased condition of the teeth or their surroundings. It may occur from exostosis on the roots of the teeth or in their alveoli, or from an alveolar abscess pouring its pus into

the cavity of the antrum, while *its* membrane still continues to secrete and discharge healthy mucous; or, according to De Blainville, "it is the two-fold internal movement of composition and decomposition at once general and continuous," or the cohesion of units like those of which it is built up, and the rejection of the unlike units.

The symptoms of inflammation, in contradistinction to mucous engorgement, are pain from the commencement, referable to the cheek, to the border of the alveolus, and not infrequently a dull pain in the frontal sinus. If the natural opening into the nostril remains, the discharge of fluid through the nostril ofttimes, from its acrid character, greatly irritates its membrane, and should this fluid be discharged through the posterior nares into the throat, the membrane of the alimentary canal may become affected. Fever is more or less attendant, with rigors, tenderness of the cheek on the affected side, with persistent pain in the antrum.

The treatment consists in the ascertainment of the cause and its removal; after which leeches to the gum, and general antiphlogistic treatment. If, however, the patient be in a debilitated condition, tonics and stimulants would be the rational treatment, avoiding blood-letting; among the tonics and stimulants, cod-liver oil and whisky, quinine and whisky, iron preparations, arsenic, the phosphites of lime, oxygen, etc.

If there is no discharge from the nostril, and the passage is found on examination to be open, the diagnosis would be formation of pus between the periosteum and mucous membrane of the antrum. These structures are generally so inseparately connected by nature, they are so essentially distinct from each other, as to become separated by disease for a considerable space of time before either becomes destroyed. If, then, on the extraction of a tooth or teeth there should follow a discharge of pus, it may be from an abscess about the root or roots of the supposed offending members, and may not have penetrated the mucous membrane of the antrum, but may have so distended or pushed up the mucous membrane as to cause swelling of the cheek and surrounding tissues. If, then, an injection be forced into the cavity of the extracted tooth or teeth, and the distention be aggravated, and the injected fluid return through the opening already made, it would indicate the disease located between these membranes, and a perforation into the antrum at this stage would prove an aggravation instead of a benefit; and upon this diagnosis we should not make a mistake.

Should the inflammation pass beyond resolution, then suppuration follows. Suppuration may follow without preceding active inflammation. This usually occurs only in those of cachectic habits, and the acute symptoms are usually absent. The true and unmistakable

diagnostic sign is the discharge of pus into the nostril. The treatment is similar to the treatment of mucous engorgement, with the constitutional treatment employed in addition.

Caries and necrosis of the bony walls are not infrequent occurrences, and may result from any of the other mentioned causes, mechanical injury or constitutional taint.

Diagnosis.—Holmes says: "The presence of necrosed bone gives the discharge the peculiar characteristic odor which is familiar to every surgeon, and is known as the 'dead-bone fetor.'" Bond says: "The discharge is fetid, dark, and sanious, with fungous granulations shooting up."

Whenever the disease is sufficient in intensity to destroy the nutrition of the bone, necrosis follows. Harris mentions in this connection that "whenever caries or necrosis is present the wall of the antrum may be bent." Should exfoliation of bone take place, the diagnosis would be sufficient without the further probing for detached or roughened surfaces of bone. It is sometimes under these conditions necessary to make larger openings into the antrum, and remove the detached septa or bone before a cure can be effected. "Caries of the bone," Bond says, "may occur from the same causes which induce ulceration in the soft parts."

Ulceration of the lining membrane of the antrum usually occurs from active inflammation of such intensity as to produce molecular death, from depraved conditions of the general health, and from modifications of the nutritive functions generally. The ulcerations may range from the benign to the malignant.

Herbert Spencer says: "When ulceration has gone deep enough to destroy the tegumentary structures, these are never reproduced. The puckered surface formed where an ulcer heals consists of modified connective-tissue, which, as the healing goes on, spreads inwards from the edges of the ulcer."

Diagnostic signs: Symptoms similar to inflammation of the antrum, with whitish or yellow pus discharge in simple ulceration, and green, dirty yellowish, mixed with blood and pus, in the malignant form. The medicaments in simple ulceration are the same as those used in mucous engorgement, only stronger; and in the malignant form, bromine, the actual cautery, and the surgeon's knife.

The mechanical appliances which follow the surgical opening are of such a nature as to fulfill the requirements, and usually consist of a tube soldered to a gold or platinum plate attached to the adjoining teeth, and kept in position for a longer or shorter period. This tube is of such size as to permit the free admission of a syringe-nozzle, with space sufficient to allow the accumulated fluid to pass out; or, should it be determined to force the fluid through the nostril, the nozzle

should then fit the tube tightly. The palate opening of the tube is stopped with cork or wood, to prevent the ingress of food or fluids of an irritating character into the antral cavity.

It would carry this paper beyond the usual limits if an attempt was made to enumerate *all* the abnormal conditions of the antrum. I fear I have already trespassed upon your patience, and will only mention that tumors, if simple in nature, are easily treated and cured by some of the medicaments already mentioned; if malignant, the only correct diagnostic sign is their appearance under microscopical examination, and, of course, their thorough removal by the surgeon's knife, or caustic applications should *they* be decided upon.

Insects in the antrum are usually destroyed by the injection of oil or other fluids. Teeth or other foreign substances are to be removed by an opening at a point the least objectionable and most accessible.

The deductions from the above are: First, that the teeth from their proximity to the antrum are the most frequent external factors of disease of this important sinus; second, that any irritation of the mucous membrane of the nose caused by any agent may be also an important factor; third, that disease of the antrum is of frequent occurrence, and is often referred by the patient to some point distant from the actual disease; fourth, that all pains referred to the frontal sinuses by patients should command a careful examination of the conditions of the teeth in the locality of the antrum, and we should not be led astray in the diagnosis by the similarity of the effects produced; fifth, the thorough evacution of the cavity of its fluid, solid, or pus contents, before the application of medicaments, and constitutional remedies should be employed as adjuncts whenever required; sixth, that all uneasiness of one or both sides of the face, with referred pains to the frontal sinuses, to the borders of the alveolus, or cheek, when not traceable to a direct cause, should command a careful, patient, and thorough examination for abnormal conditions of the antrum.

These specimens which I have here are to show the conditions of the hard tissues after diseases of the antrum. It is a rare occurrence that any tooth projects into the antral cavity; usually it is attributable to the removal of the bone in some way, thereby bringing the teeth into proximity with the antrum. One specimen is to show the opening that is sometimes made in the canine fossa for the removal of some foreign substance in preference to the extraction of a tooth.

Discussion.

Dr. W. H. Atkinson. Mr. President and Brethren: The gentleman who has last spoken has given us a review of his apprehension of the literature of this subject, and yet has directly referred to what

could only have been apprehended by personal experience. The only points I would refer to, except in the way of commendation, would be that the doctor has not gone quite far enough nor taken enough territory to treat of the tumors that frequently arise in the antrum, and has made two or three statements that are not tenable. The difference in the antral cavity has been mentioned in all the works I know anything about. He says it is not referred to. I have never seen two that were alike in shape or in capacity of contents. I have seen many teeth that did enter into the cavity. The deduction from that is this,—that the antral cavity has not attained its full size until after the teeth are all developed, so that the teeth may have been developed in perfect sockets to the very ends, and afterwards been thinned out, just as almost all hollow organs of the body are, including the alimentary canal and all the long bones, which are in the first place solids, and are subsequently made hollow by a process that we do not very well understand; and that affords us the difference of view as to whether there is a type that orders all operations of the nutrient changes and the changes of growth in all organisms that are endowed with functions, or whether there is in matter itself an ability to fulfill the intent of preparing the organs of the body for use. I apprehend that we are in a position to get at more direct views and to greater benefit than the men who claim to be very much more learned than ourselves. I refer to the M.D.'s, particularly the general surgeons. There is a domain of surgery that we as dentists have a better knowledge of than they, especially as to the superior maxillary bone and its surrounding parts, and we are able to perform operations with a reasonable expectation of a return to a healthy state where they would have no hope of such a result. They invariably advise cutting through the face in antral disease. I do not know a living dentist who would not repudiate such a doctrine and such practice. There is some little ambiguity in the doctor's method which I think a conversational investigation of this subject would soon get rid of. I do not think a man is fit to touch a disease of the antrum who needs any appliance to keep him from going through it into the eye or into the brain. I have no fellowship with such a practice. If a man has any religion about him he will be guided in the first place by a sufficient understanding of the normal condition of the parts to avoid all that sort of trouble; and, further than that, if there is any part of the human body that will tolerate mal-treatment from the worst kind of ignorance, it is the superior maxillary bone. I have seen it jammed into fragments, and return to a healthy condition in a short time. I have seen such mal-treatment, by men who claimed a knowledge they did not have, as would make a man of

any moral feeling shudder to see the processes through which they required their patients to go. The simplest way to get rid of these difficulties has been very clearly pointed out, with the exceptions I have named, and that is to get a hole large enough into the antrum. There is a great fear of entering into the chamber and breaking through the pituitary membrane where abscesses have displaced that membrane. I once sympathized very strongly in the feeling of fear of that, but that is entirely a figment of the past. The great difficulty has been that men have not been sufficiently acquainted with anatomy to give them confidence in themselves about what they were doing. I have invariably noticed that when an individual was in reality or in his own judgment master of the situation, he went forth with a confidence in himself, and a reliance upon the soundness of his judgment of what was the best thing to do, that would at once impress all who were in his neighborhood with the idea of confidence in him. And if we go to work in a hesitating way, as if we did not know what we were about, there is not one of our patients but would see we were not fit for the operation we had in hand. I do not mean to say this is so with men who are acquainted with the anatomy and physiology of the parts.

Inflammation has been referred to. There is almost nothing at all known about inflammation. We talk about mucous engorgement. What do we know about that miserable make-believe, in gynecology. Gynecologists tell their patients they have uterine engorgement. What do they mean by mucous engorgement? Mucous engorgement can only be possible in a cavity that is bounded and limited by occlusion of the outlet. It was shown by the doctor in the paper that the folds of the mucous membrane constituted little openings between the turbinated bone and the antrum. He refers to the filtering of mucus through the mucous membrane covering the cribriform plate of the ethmoid bone as if it were abnormal. This filtering through the normal débris in these cavities is so little understood by physiologists, physicians, and dentists as to make it almost hazardous to talk about it. The difficulty of understanding what the pituitary membrane is is shown in the fact that formerly it was believed that it was a prolongation of the pituitary body situated under the brain. The ancients gave that name to the organ, and the term indicated that it was a mucus producer. They did not know how tissue, blood, and mucus were composed. We heard to-night about mucus and sanies; we did not hear anything about ichor.

We have seen in the *Medical Record* and other journals the statement that diseased teeth will produce this, that, and the other disease in the human body. They simply throw their sins of ignorance

upon the poor things we call teeth. "Be sure you are right, then go ahead." That is the way everybody should do. I am happy that my brethren of this society have the intelligence to understand what has been said, and I hope the morality to put it into practice when they go home. The sin of this body is that it will not study the papers that are presented by earnest workers like my brother here. There is not a decade in the last ten decades that will show such progress as has been made in this. When could we have seen such faces as all these before us to-night, with such manipulative genius. I have too much of Quaker blood in me to flatter you by saying you are the best anatomists, microscopists, and histologists. You know that I have pleaded hard with you, and with but little appreciation, to study these fine things, that you might know what these changes are that constitute the difference between healthy blood, healthy pabulum, and healthy mucus, and dead blood or pus, rotten pus or sanies, and rotten sanies or ichor. Then we would be able to get a mental grasp of these things, so that we need not tell forty lies to get one truth before a body.

Dr. Foster. Of course this little appliance I have presented to you was not intended for dentists, but only for physicians, you know! Another question upon which the doctor disagrees with me I am very glad he has spoken of. He says that he learned some years ago not to care whether the disease was in the periosteal membrane, or in the mucous membrane of the antrum, and that he did not particularly care if he did go through that membrane into the antrum.

Dr. Atkinson. I would not care whether I did or not.

Dr. Foster. Well, I should. That is the difference between the doctor and myself. I should care for this reason: If I wanted to establish pus in the antrum, I should proceed exactly in that way, by making an opening into it and allowing the pus to discharge into the antrum, and have the mucous membrane irritated, instead of confining the irritation between the lining membrane and the periosteum, where I could control it and shut out this pus flow. Although I understand that a little heed to the point of gravity would prevent that, yet the pus would go into the cavity and produce more irritation of the mucous membrane of the cavity. The point I was trying to make was to keep the pus from discharging into or coming in contact with the mucous membrane of the antrum under those circumstances.

Dr. Atkinson. That is exactly what I wished to get at, and that we shall use terms so they will always mean the same thing, and not those that may have a dozen different interpretations. I have just defined pus; and if it was pus I don't care where it goes; it would be taken care of. If it goes into the antral chamber, all right;

but if it is sanies, then I would rather keep it out. It sets up a ferment and retrogressive metamorphosis, and is an offence wherever it is. If you can get an opening you may be able to wash into the chamber, and by introducing proper medicaments get a revulsion of that thickness of the mucous membrane, so that nature can carry on the nutrient activities in a normal way afterward. Anyone who attempts to treat these cases should understand that treatment once a week is just about like saying your prayers once a year. It don't amount to much. It is like prescribing chlorate of potash for *stomatitis materna*, or nursing sore mouth, and directing its use every three hours. If you do not use it every twenty or thirty minutes you might just as well not use it at all. It is a disinfectant, and it is that which destroys the things that infect the part. Where does that infection come from? From the ferment that is set up by the proximity of the fermenting body. In such cases we want over-treatment rather than under-treatment, although much mischief has come from the over-treatment of medical men and dentists. We are medical men, or else we are nobodies,—mere puppets, mechanics, tinkers, shoemakers. If we are not medical men, we are dealing with everything that medical men deal with, and one besides. Dental specialism includes physiology, pathology, and therapeutics, in addition to handicraft and the trained intelligence of the artist. The one word *disease* determines the whole question. Dental lesions can be successfully combated only through recognition of the circle of physiological and pathological sympathies which include every portion of the animal economy. I am a little bit in earnest here. St. Paul said it was a good thing to be earnestly affected in a good cause; and what cause is a better one than that of redeeming the world from false teaching?

Dr. Frank Abbott. Mr. President, as far as the anatomy, physiology, functions, etc., of the antral cavity are concerned, I shall say nothing; but will, if you please, say a few words regarding the manner of treatment of disease of the antrum, which usually consists of abscess. There are other diseases of the antrum, but the majority with which I have come in contact are abscesses which have been produced by dead or pulpless teeth. The statement was made by the essayist that only very seldom is the antrum pierced by roots of teeth. My impression is, and I think careful examination and observation will bear meout in that position, that more than half the people in this country have the roots of their upper molars so situated that there is no alveolar process, no bony structure, between the apex of the roots and the floor of the antrum, and that they are separated from that cavity merely by the mucous membrane lying over them with the periosteum underneath. I usually use much weaker or less irritat-

ing medicines than the doctor recommends. I do not believe it is conducive to the early healing of diseases in the antrum to use strong or severely irritating remedies, which frequently result in much injury. Of course time will settle matters of this kind, and time will heal an abscess in the antrum, no matter what the cause may be, if that cause be removed. In making and retaining an opening for the discharge of pus, I would proceed a little differently from the plan recommended by the essayist. Instead of using a tube in the cavity (an abomination) fastened to a plate and passed through the opening left by the extraction of a tooth, I would use a little piece from a whisk broom, which I barb slightly to prevent the cotton which I twist upon it from slipping off into the antrum. I then put the cotton in position, tie a bit of floss-silk to the stick, dip it into carbolized oil, and carry it up into the opening until I am satisfied that it has penetrated the cavity. I then tie the silk around an adjoining tooth, and place a fresh one in position in this manner after treatment every day. As signs of improvement become apparent, each day reduce the plug slightly, when it will be observed that the opening closes around the bit of cotton, till finally it is so small that no plug at all is required. As long as you can throw anything into the antrum with a fine-pointed syringe, wash it out every day with an antiseptic. For that purpose I use carbolic acid, solution 1 to 64 ; very seldom anything stronger than a little tincture of iodine added to this solution. I have seen cases which yielded very slowly indeed where it would seem advisable to use something stronger, but in nearly every instance where I have ventured to try it I have regretted it. Once I used corrosive sublimate, 1 to 5000, and kicked up such a muss in the antrum that it was three or four days before the disturbance was overcome. Whether the extraordinary trouble was caused by that agent or something else, I am not absolutely certain; but I was troubled, and I know that this unlooked-for condition occurred only in the parts to which I applied this remedy. This experience warranted me in dropping corrosive sublimate in the treatment of disease of the antrum. I use in all cases a spray instrument for introducing the medical agents, and get better results from the use of the remedies in that way than in any other, which is due to the fact that the medicine reaches every part of the antrum at once, whereas when introduced with a syringe it strikes its roof or sides, and flows down or out without reaching all the inflamed portions of its lining mucous membrane.

Dr. Clark. Dr. Atkinson has given you a principle governing these cases, to which I want to further draw your attention. I think we lose sight of one very important point in the treatment of antrum

troubles. The question is what is ichor or sanies? The doctor says it is a septic. But what is a septic? Can you answer that? Until you find out what this septic is, it is presumable that you cannot treat it intelligently. A septic should be treated with antiseptic remedies. This septic is organic in its nature, and if we treat it as we would any other septic organic disease, we will meet with a great deal more success. We hear about all manner of remedies for it. At one of our meetings a short time ago Dr. Abbott gave a number of different remedies for disease of the antrum. They are mostly antiseptics, and used because they are antiseptics. We know by experience that antiseptic remedies are efficacious. You simply need an antiseptic, and I ask what is the use of all these different remedies when one or two will answer the purpose? If we would consider what the nature of a septic is, we will treat septic conditions more intelligently. I firmly believe that the treatment of these antrum diseases, wherever ichor or pus is present, will come to be the same as our treatment of diseases in the mouth. A few years ago we knew nothing about carbolic acid. We were using creasote, just because we knew it was good, without knowing why. Then we got to using carbolic acid, and we did not know why we used it, except that it had a good effect. We did not then know that it was the most powerful disinfectant in the materia medica. We know it now, and that it is about the only safe and reliable agent we can use to destroy these micro-organisms. I believe that when we come to understand these septic conditions more intelligently we will find them to consist of organisms that we can see and separate and cultivate.

Dr. Atkinson. I wish to amend Dr. Clark's remarks in one particular, where injustice may be done to Dr. Foster. The key-note of all this matter has been very clearly pointed out in the paper in the reference to constitutional degeneration. There is no such thing as local disease of the antrum that is not an expression of constitutional deterioration, if it is not traumatic. This is too important a point to be passed over by dentists, who usually pay more attention to mechanics and fine manipulations than they do to the principles that govern derangements of the organs with which they deal, and which make their discriminations and manipulations necessary. Dr. Foster did speak of constitutional treatment. I do not undertake a case of this kind without constitutional treatment. I am not at all afraid of using locally one in one thousand, or one in five hundred, of the bichloride of mercury, when it is not too often repeated. I take it to be utterly impossible, unless in some rare case of idiosyncrasy, to get any untoward effect upon the living tissue by an application of one in two thousand of the bichloride of mercury. We

should know something about the molecular changes that we are dealing with all the time, and then we would not so hastily jump at conclusions in the presence of men who are inquiring for the truth. We would better come short of our knowledge than give erroneous dicta, and the impression that we as old men know too much. Young men, hold on to your judgment until you can comprehend it. The blood crasis has to be in a healthy condition to perform healthy operations in the body; and it is only the deterioration of the molecules of the blood column and its resultants that we are dealing with in what is called disease. That means something more than derangement of the elements. There may be a lack of ease, to be sure, but there is some sort of entical presence that needs to be extirpated from the body; and the sooner we disabuse our minds of that other notion the better it will be for us all.

Mr. President, I want to make a motion that we, from our hearts, offer our warmest thanks and appreciation to the two gentlemen of such ability who have come here from distant cities to help us to apprehend what they have attained by great labor.

Dr. Atkinson's motion was carried.

Dr. Foster. I think Dr. Abbott must have misunderstood me, or he would not have suggested that the remedies I employ are too strong. The first remedy that I spoke of was tepid water. I do not know of anything weaker than that.

Dr. Abbott. That I never would use.

Dr. Foster. And I stated that one-half to one grain of the medicaments named might be used to an ounce of water; and in other cases ten to fifteen grains were required, when the abscess or tumor assumed a more malignant form.

Adjourned.

B. C. Nash, D.D.S., *Secretary.*

LOUISIANA STATE DENTAL SOCIETY.

The annual meeting of the Louisiana State Dental Society was held at Tulane Hall, New Orleans, March 4, 5, and 6, 1886.

The following officers were chosen for the ensuing year: George J. Friedrichs, president; D. G. Parker, first vice-president; M. J. Massingill, second vice-president; A. C. Gayle, corresponding secretary; Charles Eckhardt, recording secretary; C. C. Baquie, treasurer; Joseph Bauer, A. G. Friedrichs, J. R. Knapp, O. Salomon, J. W. Adams, and P. J. Friedrichs, executive committee.

The next meeting will be held in New Orleans on the first Wednesday following Mardi-gras,—February 23, 1887.

Charles Eckhardt, *Secretary,*
No. 348½ Magazine street, New Orleans, La.

CENTRAL DENTAL ASSOCIATION OF NORTHERN NEW JERSEY.

At the annual meeting of the Central Dental Association of Northern New Jersey, February 15, 1886, the following officers were elected: B. F. Luckey, president; George E. Adams, vice-president; James G. Palmer, secretary; Charles A. Meeker, treasurer; S. C. G. Watkins, W. P. Richards, Harvey Iredell, Oscar Adelberg, and C. F. Holbrook, executive committee.

James G. Palmer, *Secretary*, New Brunswick, N. J.

GEORGIA STATE DENTAL SOCIETY AND EXAMINING BOARD.

The eighteenth annual meeting of the Georgia State Dental Society will be held in Macon, Ga., on the 11th day of May, 1886.

The State Board of Dental Examiners will meet at the same time and place. Every person, without exception, commencing the practice of dentistry in the State of Georgia since the 9th day of October, 1885, must have a license from the Board of Examiners.

This will doubtless be the most brilliant meeting ever held by the society.

L. D. Carpenter, *Secretary*,
Atlanta, Ga.

IOWA STATE DENTAL SOCIETY.

The twenty-fourth annual meeting of the Iowa State Dental Society will be held in the buildings of the Dental Department of the State University, at Iowa City, beginning the first Tuesday in May, and continuing four days.

A very interesting programme has been prepared.

A cordial invitation is extended to dentists from other States, as well as to those of our own State, to be present.

J. B. Monfort, *Secretary*,
Fairfield, Iowa.

ILLINOIS STATE DENTAL SOCIETY.

The twenty-second annual meeting of the Illinois State Dental Society will be held at Rock Island, Ill., beginning Tuesday, May 11, 1886, and continuing four days.

Dentists in this and adjoining States are cordially invited to attend.

J. W. Wassall, *Secretary*,
208 Dearborn avenue, Chicago.

TEXAS DENTAL ASSOCIATION.

The sixth annual meeting of the Texas Dental Association will be held in Austin, beginning the first Tuesday in May, 1886, and continuing four days.

T. Robinson, *Cor. Secretary*, Houston, Texas.

FIFTH DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The Fifth District Dental Society of the State of New York will hold its eighteenth annual meeting at Rome, N. Y., on Tuesday and Wednesday, April 13 and 14, 1886.

Members of the profession from other societies are invited to attend and take part in the discussions.

C. J. Peters, D.D.S., *Secretary*, Syracuse, N. Y.

IOWA STATE BOARD OF DENTAL EXAMINERS.

The next regular meeting of the Iowa State Board of Dental Examiners will be held in Iowa City, on Monday, May 3, 1886, at 10 A.M., at which time applicants for license are expected to report promptly. It may be well to note that the date is one day previous to the meeting of the State Dental Society, which will be held at the same place.

W. P. Dickinson, *Secretary*,
Dubuque, Iowa.

PENNSYLVANIA COLLEGE OF DENTAL SURGERY.

The thirtieth annual commencement exercises of the Pennsylvania College of Dental Surgery were held at the Academy of Music, Philadelphia, on Saturday, February 27, 1886, at 8 o'clock P. M.

The valedictory was delivered by James E. Weirick, D.D.S., and the address to the graduates by Professor Albert P. Brubaker, M.D., D.D.S.

The number of matriculates for the session was one hundred and forty-six.

The degree of D.D.S. was conferred on the following graduates by S. W. Gross, M. D., president of the board of trustees:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
J. Frank Adams, L.D.S.	Canada.	Johan Nawroth	Germany.
Theodore Balderson	Pennsylvania.	Olga Neymann, B.L.	New York.
Franklin H. Benner	Pennsylvania.	Nettie Ogilvie	West Indies.
William F. L. Biddell	Pennsylvania.	Walter J. Phillips	Iowa.
Albert C. Blind	Pennsylvania.	J. Thomp. Price	Ohio.
A.P. Brubaker, A.M., M.D.	Pennsylvania	Charles S. Potts	Pennsylvania.
Anna Castner	Germany.	Levi Pownall	Pennsylvania.
William T. Chambers	Ohio.	J. Clark Rankin	Pennsylvania.
Louise M. Diederich	Germany.	Edwin P. Robinson	New York.
Henry Fraser	West Indies.	James S. Rutter	Pennsylvania.
Benjamin H. Goodsell	New York.	J. Herbert Sahler	Pennsylvania.
C. Fred. Gould	Iowa.	J. G. Santana	Cuba.
William E. Holland	Pennsylvania.	Maria M. Schneegans	Germany.
Harry G. Keeler	New Jersey.	Henry Charles Smale, L.D.S.	England.
James H. Keisel	Pennsylvania.	Norberto E. Soto	U. S. of Colombia.
Wilbur A. Kessler	Pennsylvania.	George A. Swann	Canada.
Henry G. Kemper	Pennsylvania.	Charles Swap	Missouri.
Lucius A. Kelsey	New York.	James Tait	Pennsylvania.
John P. Libhart	Pennsylvania.	Oliver H. Taft	New York.
David Souper Lyon	New Jersey.	Thomas W. Thomas	Pennsylvania.
Woodward R. McCloskey	Pennsylvania.	James E. Weirick	Pennsylvania.
J. Eugene Mohr	Pennsylvania.	Park W. Wicks	New York.
A. Milton Musser, Jr	Utah.	John J. Whaley	Canada.
Frank W. Monroe	Pennsylvania.	Olga Wernickie	Pennsylvania.

PHILADELPHIA DENTAL COLLEGE.

THE twenty-third annual commencement exercises of the Philadelphia Dental College were held at the Academy of Music, Philadelphia, on Friday, February 26, 1886, at 8 P. M.

The address to the graduates was delivered by Professor T. C. Stellwagen, M.D., D.D.S., and the valedictory by J. Collord White, D.D.S.

The number of matriculates for the session was one hundred and forty-six.

The degree of D.D.S. was conferred on the following graduates by the president of the board of trustees:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Henry Behrens, Jr.	New York.	Adolph Jackson	California.
Elsworth E. Bentzel	Pennsylvania.	William B. Knox	New York.
Bernard B. Bray	Texas.	A. R. Markel	Pennsylvania.
Cornelia Brown	Pennsylvania.	Grant Mitchell	Ohio.
Gordon Brown	Missouri.	William H. Newton	Massachusetts.
Wm. A. Bryant (M.D.)	California.	Charles C. Patton	Maine.
Harry H. Burchard	Pennsylvania.	Will S. Payson	Maine.
Irwin G. Burton	Delaware.	Frank A. Post	NewYork.
Alonzo H. Carlile	Delaware.	Hugh G. Pullen	Canada.
George W. Cochran	Ohio.	Walter J. Quinlan	Canada.
Charles W. Collins	New York.	Charles H. Riggs	Florida.
W. R. G. Downes	Canada.	Whitman C. Robbins	South Africa.
James R. F. Fitzpatrick	Massachusetts.	John P. Ruf	New York.
H. Edward Forrester	New York.	A. G. Smith	Ohio.
Arthur B. Freeman (M.D.)	Illinois.	F. W. Smith	Maine.
Clayton G. Gable	Pennsylvania.	Charles E. Stephenson	Pennsylvania.
Henry L. Gilmour, Jr.	New Jersey.	Lee K. Stewart	Illinois.
Jennie R. Gould	Pennsylvania.	C. E. Thompson	New York.
J. A. Greenawalt	Pennsylvania.	Curtis B. Tiley	Connecticut.
A. C. Manfred Hafstrom	Sweden.	Henry T. Walker	Texas.
Glyndeur Hickman	Pennsylvania.	J. Collord White	Pennsylvania.
W. H. J. Holman	Pennsylvania.	Seymour M. White	Pennsylvania.
Charles W. Huntington	New York.	W. H. White	Canada.
Ernest J. Husband	Canada.	Harman Yerkes	Pennsylvania.
Otto E. Inglis	New Jersey.	M. Pastor U. Zegers	Chili.

KANSAS CITY DENTAL COLLEGE.

THE annual commencement exercises of the Kansas City Dental College were held, in connection with those of the Kansas City Medical College, at Music Hall, Kansas City, Mo., Tuesday evening, March 16, 1886.

The annual address was delivered by Hon. J. L. Peak, and the faculty address by Prof. T. S. Case.

The number of matriculates for the session was fifteen.

The degree of D.D.S. was conferred on the following graduates of the dental class by Prof. E. W. Schauffler, president of the faculty:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
J. N. Chipley	Colorado.	M. Tullis	Great Bend, Kansas.

BALTIMORE COLLEGE OF DENTAL SURGERY.

The forty-sixth annual commencement of the Baltimore College of Dental Surgery was held at the Academy of Music, Baltimore, Md., on Saturday, March 6, 1886, at 8 P.M.

The annual oration was delivered by Richard Gundry, M.D., and the valedictory by William Henderson Weaver, A.B.

The number of matriculates for the session was one hundred and three.

The degree of D.D.S. was conferred on the following graduates by Professor R. B. Winder, dean of the faculty:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
W. F. Andrews	Massachusetts.	Sandy H. Houston, A.B.	Pennsylvania.
Abraham L. Ashbrook	Pennsylvania.	H. Herbert Johnson	Georgia.
George W. Baker, Jr.	Pennsylvania.	Henry A. Joyner	North Carolina.
Harry F. Baynes	Canada.	George Charles Keller	Maryland.
August Burghard	Florida.	Charles C. Laubach	New Jersey.
Charles W. Bradsher	North Carolina.	A. C. Lindsley	New York.
Walter F. Brown	South Carolina.	Robert H. Marshall	Louisiana.
Emory A. Bryant	Colorado.	John W. Mitchell	Maryland.
Currey Cappel	Louisiana.	J. Edgar Orrison	Virginia.
Howard H. Carroll	Maryland.	James M. Ovenshire	New York.
Charles E. Colardeau	West Indies.	L. Ernest Payne	Maryland.
Henry S. Colding, M.E.	Georgia.	Albert A. Pearson	Alabama.
R. G. Covode	Pennsylvania.	J. F. Patterson	New York.
Wallace M. Downey	Pennsylvania.	Worthington Pinney	New Jersey.
Winfield B. Dulaney	Virginia.	Robert S. Russell	Tennessee.
James P. Farley	Massachusetts.	Robert Owen St. Clair	Virginia.
J. William Foley	Maryland.	Robert W. Starr	Maryland.
J. F. Gregg	Pennsylvania.	Frank W. Stiff	Virginia.
J. Eayre Hendrickson	Dist. Columbia.	Aljarine T. Summerlin	Georgia.
E. Hill	Georgia.	Thomas C. Vankirk	Pennsylvania.
Bolling Hobson	Virginia.	William H. Weaver, A.B.	Georgia.
Silas Hubbell	New York.	W. Budington Wright	New York.

OHIO COLLEGE OF DENTAL SURGERY.

The fortieth annual commencement of the Ohio College of Dental Surgery was held at College Hall, Cincinnati, Ohio, on Wednesday evening, March 3, 1886.

The annual address was delivered by Rev. John Rusk, and the valedictory by C. E. Esterly, D.D.S.

The number of matriculates for the session was sixty.

The degree of D.D.S. was conferred on the following graduates by G. W. Keely, D.D.S., president of the board of trustees:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
H. L. Bryant	Minnesota.	E. G. Logan	Ohio.
J. C. Corcoran	Minnesota.	C. F. Materne	New York.
C. M. Doss	Illinois.	C. B. Meckel	Indiana.
C. E. Esterly	Kansas.	L. B. Moore	Ohio.
W. B. Gordon	Indiana.	A. F. Muenter	Germany.
M. H. Guthridge	Ohio.	J. Q. Neptune	Ohio.
W. M. Hart	Ohio.	F. T. Struckman	Ohio.
H. M. Howard	Ohio.	E. B. Swift	Ohio.

R. E. Wyatt............Ohio.

NEW YORK COLLEGE OF DENTISTRY.

The twentieth annual commencement of the New York College of Dentistry was held at Chickering Hall, New York City, on Wednesday evening, March 10, 1886.

The valedictory was delivered by Edmund E. Minner, D.D.S., and the address to the graduates by F. F. Van Derveer, Esq.

The number of matriculates for the session was one hundred and seventy-nine.

The degree of D.D.S. was conferred on the following graduates by M. McN. Walsh, Esq., president of the board of trustees:

Charles B. Atkinson.
Edward Bornschein.
Alfred Berghammer.
Henry N. Betting.
Sands J. Bowman.
Charles A. Bush.
William J. Brenan.
Victor G. Barr.
Ernest Burt.
Furman Clayton.
Joseph C. Clegg.
Willis W. Coon.
George D. Coén.
Andrew McC. Crandall.
Frank C. Chamberlain.
Elwood C. Davis.
Lewis Engle.
Edward D. Frost.
William F. Heath.
John I. Hart.
Charles De W. Henry.
Ferdinand Heindsmann, Jr.
Edward P. Jenkins.
William H. Kenzel, Jr.
Frederick B. Keppy.
George Koch.
Isaac W. Knapp.
John C. Lynch.
Edmund E. Minner.
Frank J. Maynard.
George P. Manville.
Frank A. Myrick.
Thomas W. Onderdonk.
Bissell B. Palmer.
William M. Slack.
Sidney E. E. C. K. Smith.
George J. Schreiber.
George C. Sanders.
Leverett Somers.
George Sandhusen.
Louis E. Stuart.
Peter S. T. M. Siqveland.
Friend M. Schell.
Ernest Sturridge.
Robert Stewart.
Archibald Taylor, Jr.
Thomas C. Treadwell.
Eugène S. Vogt.
Joseph S. Vinson.
James C. Whaley.

INDIANA DENTAL COLLEGE.

The seventh annual commencement of the Indiana Dental College was held in the college lecture room, Indianapolis, on Wednesday evening, March 3, 1886.

The annual address was delivered by J. N. Hurty, and the valedictory by J. Harry Palin, D.D.S.

The number of matriculates for the session was twenty-eight.

The degree of D.D.S. was conferred on the following graduates by W. L. Heiskell, D.D.S., president of the faculty:

NAME.	RESIDENCE.
L. L. Clark	Massachusetts.
A. L. Jones	Indiana.
E. E. Jones	Illinois.
O. S. Linn	Indiana.
J. E. Montgomery	Pennsylvania.
J. H. Palin	Indiana.
A. S. Price	Kentucky.
W. H. Rowand	Ohio.
R. M. Smiley	Indiana.
E. E. Stewart	Ohio.
W. N. Wilson	Indiana.

VANDERBILT UNIVERSITY—DEPARTMENT OF DENTISTRY.

The seventh annual commencement of the Department of Dentistry of Vanderbilt University was held in the University Chapel, Nashville, Tenn., on Wednesday evening, February 24, 1886, at 8 o'clock.

The address on behalf of the graduating class was delivered by Samuel J. Harrell, D.D.S.

The number of matriculates for the session was seventy-six.

The degree of D.D.S. was conferred upon the following graduates by L. C. Garland, LL.D., chancellor of the university:

NAME.	RESIDENCE.
E. W. Blakemore	Tennessee.
Gilbert F. Brown	Illinois.
A. P. Campbell, Jr.	Kentucky.
Thomas Cole	Georgia.
Wilson H. Cotton	Kentucky.
Thomas Crenshaw	Georgia.
J. S. Fann	Georgia.
John E. Ferguson	Georgia.
L. M. Frink	Florida.
Edgar N. Fruit	Kentucky.
R. M. Galloway	South Carolina.
Jacob W. Guerard	South Carolina.
Samuel J. Harrell	Louisiana.
Robert L. Hensley	Texas.
Delus Haynes	Kentucky.
W. B. Houston	South Carolina.
George A. Louque	Louisiana.
A. D. Lampkin	Mississippi.
S. H. Keener	Tennessee.
Frank H. McCalla	Georgia.
N. B. McLean	Texas.
George T. Neal	Georgia.
W. A. Patrick	Alabama.
S. J. Powell, Jr.	Louisiana.
Thomas A. Pope	Tennessee.
E. E. Prothro	Tennessee.
J. F. Ramsay	North Carolina.
S. C. A. Ruby	Tennessee.
M. S. Sale	Virginia.
W. F. Slaughter	Alabama.
John L. Stokes	South Carolina.
A. C. Strickland	South Carolina.
John W. S. Spurgeon	North Carolina.
Manley Timmons	South Carolina.
M. J. L. Townend	Mississippi.
Bennett Truly	Mississippi.
D. B. Turner	Tennessee.
J. E. White	Georgia.
William N. White	Kentucky.
Edwin T. Winkler	Georgia.

MINNESOTA HOSPITAL COLLEGE—DENTAL DEPARTMENT.

The annual commencement of the Minnesota Hospital College, Dental Department, was held, in connection with that of the Medical Department, at the Hennepin-avenue M. E. Church, Minneapolis, Minn., February 26, 1886.

The annual address to the graduates was delivered by Professor Cyrus Northrup, LL.D.; the valedictory by W. H. Shaver, M.D., D.D.S.

The number of matriculates for the session was fourteen.

The degree of D.D.S. was conferred on the following graduates by C. H. Hunter, M.D., president of the faculty:

NAME.
John Dickson.
C. V. R. Doolittle.
George W. Dysinger.
Alger W. French.
W. R. Martin.
E. J. Morrison.
C. L. Remington.
W. H. Shaver, M.D.

UNIVERSITY OF MARYLAND—DENTAL DEPARTMENT.

The fourth annual commencement of the Dental Department of the University of Maryland was held at the Academy of Music, Baltimore, Md., on Wednesday, March 17, 1886.

The reading of the mandamus was by the dean, Professor Ferdinand J. S. Gorgas, M.D., D.D.S.

The annual address was delivered by Col. William Allen, president of McDonough Institute.

The number of matriculates for the session was ninety-one,—larger than ever before. The number of graduates is smaller on account of a strict compliance with the *two-session rule* as a requisite for graduation.

The degree of D.D.S. was conferred upon the following graduates by Hon. S. Teackle Wallis, LL.D., provost of the university:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Emil Amend	Germany.	Charles W. Hartwig	Maryland.
Frank A. Baden	Maryland.	John H. Hoffman	Virginia.
Horace E. Basehore	Pennsylvania.	G. Allen Huggins	South Carolina.
Emile Brugeille	France.	William H. Lowell	Pennsylvania.
Thomas W. Bookhart	South Carolina.	Frank H. Lumsden	Maryland.
William W. Bruce	West Virginia.	Lloyd T. Macgill, Jr.	Maryland.
Oscar J. Campbell	Virginia.	Wilfred A. Pleasants	Virginia.
Augustus H. Chafee	South Carolina.	W. Eppes Proctor, Jr.	Virginia.
John S. Diehl	Pennsylvania.	Ralph C. Purnell	Maryland.
Joseph G. Emerson	Brazil, S. Am.	James M. Riley	North Carolina.
Charles Luff Furman	New York.	Lewis N. Shields	Texas.
Elly A. Gasque	South Carolina.	Benjamin F. Sims	South Carolina.
A. H. Greenawalt, D.D.S.	Pennsylvania.	Frank E. Slocum	New York.
Joseph A. Wall	Pennsylvania.		

ROYAL COLLEGE OF DENTAL SURGEONS OF ONTARIO.

The eighteenth annual examination of the students of the Royal College of Dental Surgeons of Ontario, Canada, was held in Toronto, March 2 to 5, 1886.

The examination being wholly written, no thesis is required.

No formal commencement is held.

The number of students in attendance during the session of 1885–6 was forty-one.

The following received certificates of license to practice dentistry in Ontario and the title of L.D.S., viz.:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
J. G. Bannerman	Brantford.	W. A. Leggo	Ottawa.
J. H. Carrique	Palermo.	E. A. Martin	Clinton.
C. E. Church	Ottawa.	J. A. Marshall	Shelburne.
A. M. Clark	Guelph.	Charles McKinlay	Georgetown.
J. A. Fissiault	Gananoque.	James Stirton	Guelph.
G. T. Fitzgerald	London.	Joseph Nolin	Montreal.
Robert Haslett	Guelph.	Ashley Weese	Napanee.
R. S. Ludlow	Orangeville.	W. M. Wonder	St. Catherines.

MISSOURI DENTAL COLLEGE.

The twentieth annual commencement of the Missouri Dental College was held, in connection with that of the St. Louis Medical College, at Memorial Hall, St. Louis, Mo., on Thursday evening, March 4, 1886.

The address to the graduates was delivered by H. H. Mudd, M.D., and the valedictory by Professor W. E. Fischel, M.D.

The number of matriculates for the session was twenty-nine.

The degree of D.D.S. was conferred on the following graduates by H. H. Mudd, M.D., dean:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
A. S. Halstead	Illinois.	H. L. McKellops	Missouri.
W. W. Hart.	Illinois.	G. L. Mock, M.D	Missouri.
T. E. Heatherly	Illinois.	R. Rembe	Missouri.
A. J. McDonald	Missouri.	Charles Summa	Missouri.

EDITORIAL.

THE NEXT MEETING OF THE AMERICAN DENTAL ASSOCIATION.

We give the prominence of the editorial department to the subjoined resolutions, and to the communications of Drs. Crouse and Dudley, because of the importance of the subject, and also because of the necessity for a prompt decision of the question. The character of the meeting and the number in attendance will depend so largely upon the place selected, that due consideration of the matter in all its bearings is essential to a wise choice. We commend the statement and argument of the respective committeemen to the sober thought of the profession:

At a recent meeting of a General Committee representing all of the dental organizations on the Pacific Coast the following resolutions were adopted:

1st. *Whereas*, A wish or willingness has been communicated to us by the Executive Committee of the American Dental Association to hold its annual meeting in San Francisco in August next, and the meeting of that body among us is calculated to increase the professional and public regard for the character and culture of our profession; and

Whereas, The meeting of that national body among us will be an event in the history of our profession, long sought and earnestly desired; and

Whereas, The consideration of professional ideas of a modern, theoretical, and practical nature, and a comparison of them with those of the past, will be elevating, interesting, and beneficial to the profession, individually and collectively, as well as to the people generally; and

Whereas, A visit to the State of another organization, and also another element of our Eastern co-laborers and fellow-citizens, will give additional opportunities for the investigation of our domestic and social institutions, our educational facilities, as well as our commercial, agricultural, and mineral advantages; therefore,

Resolved, That we cordially invite the co-operation of all dental societies or asso-

ciations, both State and local, that may be entitled to representation in the National Association, as well as the general profession and the people, to join us in receiving said body in a manner in keeping with the reputation of the citizens of this Coast for acts of philanthropy, public spirit, and generosity.

2d. *Whereas*, Communications have been received by various members of the profession, expressing a desire of the Executive Committee of the American Dental Association to fix upon San Francisco as the place for its next annual session (August, 1886); and

Whereas, The occasion is opportune for such a meeting here, in consideration of the inducements offered to travel that will prevail during the convention of the Grand Army of the Republic, in August of this year; and

Whereas, The meeting of the American Dental Association on this Coast, and if possible the National Associations of Dental College Faculties and Examiners, at the same time, will do much to strengthen the bonds of professional fellowship between us and our Eastern co-laborers, as well as to elevate the professional standard in this section; therefore, be it

Resolved, That the societies represented by this committee, viz., the California State Odontological Society, the Southern California Odontological Society, the Faculty of the Dental Department of the University of California, and the Alumni Association of the same department, do cordially invite the American Dental Association to hold its next meeting in San Francisco.

Therefore, in accordance with the above facts, I am instructed by the said committee to extend a most cordial invitation to the American Dental Association to hold its annual session of 1886 in this city, August next.

H. J. Plomteaux, *Secretary*,
General Committee on Invitations and Arrangements.

531 Sutter St., San Francisco, Cal.

Dr. Dudley, secretary of the Executive Committee, writes:

"In response to the invitation of the California societies, a majority of the officers, a majority of the Executive Committee, a majority of the Committee of Arrangements, all of the chairmen of sections except one, and nearly one hundred of the members have recorded themselves as in favor of accepting the invitation. The response from dentists not members, but who will attend as delegates if the meeting is held at San Francisco, indicates that it would be the largest meeting ever held by the association."

The American Dental Association.—Where shall the next Meeting be held, San Francisco or Chicago?—At a meeting in Buffalo in December, at which six members of the Executive Committee were present, a vote was taken resulting in five for Chicago, one for Buffalo. It was decided after the vote to leave the final decision and completion of arrangements with the Committee of Arrangements, they to be governed by circumstances in the final decision. Since more recently a proposition to hold it in San Francisco has been made, it is deemed best to submit the question to the profession.

The reasons for going to California have already been so fully given in the dental journals, and more recently in a circular letter, that it is unnecessary for me to take space to present them again. They read well, and make us all feel like saying Go! *Why, of course!* But facts are hard things to knock against, and it will be found much easier for the majority of the dental profession to say to

some other fellow "Go!" than it will be to muster the money and spare the time to go themselves. The rank and file of our profession are not rich men. The question of expense has to be considered by many. A large per cent. are young men that need the meeting, and the association needs them. How many will feel that they can spare the time and money necessary for so long a trip? Calculate a week to go, a week to return, the best of a week for the meeting, and two weeks to see California and the Great West, including points of interest on the route, and five weeks are gone. Fare from Chicago, round trip, $62.50; meals and sleeper not less than $5 per day; expenses $5 per day, at lowest estimate, at a time when the city and surrounding country are thronged with the Grand Army and thousands of strangers. Add to this extra railroad and steamboat fare for all side trips to points of interest, and the extras that you can never plan for, and it is easy to see by all who have traveled much that $300 would be a *very* low estimate for the expense, besides at least five weeks of time. Those who have been to California all coincide in the statement that one cannot see enough of California and the West to pay them for going without a greater expenditure of time and money than we have named. It is well known that July and August are the most disagreeable months in which to make the trip to California, and we see the country at its worst. These are the months when Californians get away if they can. Since learning the desire of some that the American Dental Association should be held in San Francisco, the California dental societies have very courteously invited us, and we are sure their hospitality will be fully appreciated by all, but there are times when we cannot afford to accept even hospitality. This is one. The association would lose too much. We could not hope for any large accession of new members, nor for the new ones gained to often meet with us from so great a distance, and we should lose many.

Chicago was selected on account of its being central, easily accessible from all parts of the country at low railroad rates, with unsurpassed hotel accomodations, and cool summers. The fact that a hundred of the new members elected last year were Western men, who should be held, also entered into the decision. Your committee have been quietly planning and working since the last meeting to insure at our next the largest attendance and most successful meeting ever yet held, feeling that each meeting should be an advance upon the one that precedes in point of numbers and interest; that we ought not only to hold the new members gained last year, but that we should add as many more at our coming session. It is too soon to complete definite railroad arrangements, but if the decision is for Chicago, we expect to bring them within the reach of all.

At an informal meeting of the Chicago members of the American Dental Association, and of the Chicago Dental Society, called to ascertain the views of the profession here, March 17, the following resolution was adopted by a vote of 27 to 5:

Resolved, That it is the sense and desire of this body that the next meeting of the American Dental association should be held in Chicago, and that we extend to the association a most cordial and hearty invitation to meet with us.

An Excursion To California After The Meeting.

Your committee are assured by the railroad authorities that they can have equally as favorable rates in all respects for an excursion upon the close of the meeting, if any considerable number wish to go to California, as are promised for the association. The committee will see that *no pains are spared* to make such an excursion a success, if enough signify their wish to go to warrant making the

arrangements. Thus, none who wish to go will be deprived of seeing California at the reduced rates and under more favorable circumstances than if the meeting were held there the last of July, while great numbers will not be deprived of attending the association because they cannot afford a trip to California. It is a serious question whether the society has a right to hold its meetings beyond the reach of so large a class. Let us remember that our association is a scientific body, intended to reach and benefit *the great body of the profession* as far as possible.

Please answer *promptly* by letter or postal the following questions:

In your judgment, should the meeting be held in San Francisco, Chicago, or elsewhere?

Do you expect to attend the meeting if held in San Francisco?

Do you expect to attend the meeting if held in Chicago?

If the meeting is held in Chicago, will you probably go to California after the meeting is over, if an excursion is decided upon?

J. N Crouse, *Chairman Executive Committee and Committee of Arrangements.*

2101 Michigan Ave., Chicago, Ill.

THE DENTAL SECTION OF THE MEDICAL CONGRESS.

We publish the following report of the action of the Chicago Dental Society over the signature of its recording secretary. We declined to admit a statement previously furnished explaining the circumstances under which the resolution was adopted, and claiming that the reported action did not express the actual sentiments of the meeting. If such is the fact, further steps should be taken to show the real views of the society. We can publish only the *official* reports of society business matters.

To the Editor of the Dental Cosmos:

Dear Sir: The following resolution was adopted at the January meeting of the Chicago Dental Society, and the corresponding secretary instructed to transmit a copy to your journal for publication:

Resolved, That this society indorse the action of the conference at Buffalo as regards the International Medical Congress.

The action is embodied in the following resolution:

"*Resolved*, That we, as members of the dental profession, deem it inexpedient to recommend the organization of a Section of Dental and Oral Surgery in the International Medical Congress of 1887 under the present circumstances."

P. J. Kester, *Cor. Secretary.*

EXPLANATORY.

An unusual pressure of matter this month has necessitated the omission of valuable material already in type. The reports of the college commencements are always an important feature of our April issue, but the increase in the number of colleges and in the lists of graduates makes such demands upon our space as to trench somewhat upon that usually devoted to other departments, but the value of the reports of the yearly graduations justifies their publication.

BIBLIOGRAPHICAL.

A System of Practical Medicine by American Authors. Edited by William Pepper, M.D., LL.D.; assisted by Louis Starr, M.D. Volume IV.—Diseases of the Genito-Urinary and Cutaneous Systems.—Medical Ophthalmology and Otology. Imperial octavo, 841 pages, and index. Philadelphia: Lea Brothers & Co., 1886. Price, cloth, $5.00; leather, $6.00; half Russia, $7.00. For sale by subscription only.

The three previous volumes of this magnificent work have been noticed in preceding numbers of the Dental Cosmos. The one before us sustains the high character of its predecessors.

Of the twenty-one contributors, nineteen occupy professorial chairs, and the other two official positions nearly equivalent to a professorship. They are as follows: Drs. B. F. Baer, William H. Byford, Francis Delafield, Edward C. Dudley, Louis A. Duhring, Robert T. Edes, George J. Engelmann, William Goodell, Samuel W. Gross, Mary Putnam Jacobi, W. W. Jaggard, Edward W. Jenks, Edward L. Keyes, William F. Norris, J. C. Reeve, Alexander J. Skene, Henry W. Stelwagon, George Strawbridge, Thomas T. Gaillard, James Tyson, James C. Wilson. This list of authors is sufficient to indicate the quality of the respective essays, which are thoroughly practical in character.

The succeeding volume will complete this great undertaking, which will present a comprehensive system of American medicine.

Lectures on Syphilis, delivered at the Chicago College of Physicians and Surgeons. By G. Frank Lydston, M.D. 12mo, pp. 184. Chicago: A. M. Wood & Co., 1885.

This little book, which consists of a collection of lectures delivered at the Chicago College of Physicians and Surgeons, is modeled after "Sturgis's Student's Manual of Venereal Diseases," and very closely resembles it, not only in size, general arrangement, and treatment of the subject, but even in typography. The author has adopted Dr. Sturgis's plan of italicizing throughout the book certain general statements supposed to convey important truths. In many instances this answers an important practical purpose; but we are inclined to think that it would be more modest in an author hitherto unknown to fame as a syphilographer, and who subscribes himself "late resident surgeon at Charity Hospital," not to settle disputed questions in syphilis—such as those of the relation of soft and hard sores and so-called "mixed" sores—in the off-hand and decisive manner which he has adopted. A careful perusal of Mr. Hutchinson's

able lectures on these points, recently published in the *British Medical Journal*, will perhaps cause him to realize that there is still legitimate room for doubt on some of the subjects which he has discussed rather dogmatically in this maiden essay.

The pathology adopted unreservedly throughout the lectures is that of Dr. Fessenden Otis, of New York, and the author seems to have a clear understanding of the very attractive, but as yet unaccepted, theories of that author.

There is no new teaching in the book, which, subject to the criticism already expressed, is fairly reliable. The English is careless, as is very apt to be the case in books made up of reported lectures.

Pamphlets Received.

First Annual Report of the Wisconsin State Board of Dental Examiners. September 30, 1885.

Proceedings of the Mississippi State Dental Association for the years 1884–1885. Published by order of the Association. St. Louis, Mo.: J. H. Chambers & Co.

Caulk's Dental Annual, No. IV, 1885–1886. Devoted to the Collection and Dissemination of Statistics Relating to the Business and Practice of Dentistry. Camden, Del.: L. D. Caulk. Price, 25 cents.

Transplantation of Teeth into Artificial Sockets. By William J. Younger, M.D., ex-president California State Dental Association, etc. San Francisco, Cal.: Reprint from "Pacific Medical and Surgical Journal and Western Lancet," January, 1886. With Addenda.

What is Medicine? Annual Address delivered before the American Academy of Medicine, at New York, October 28, 1885. By Albert L. Gihon, A.M., M.D., Medical Director U. S. Navy, president of the Academy. Philadelphia, 1886.

Philadelphia Social Science Association: "Manual Training a Valuable Feature in General Education." Read at a joint meeting of the Philadelphia Social Science Association and the Public Education Association, December 11, 1885, by C. M. Woodward, Ph. D., Director of the St. Louis Manual Training School.

Philadelphia Social Science Association. "The Relation of the Modern Municipality to the Gas Supply." Read at a Meeting of the Association, February 11, 1886, by Edmund J. James, Ph.D., professor in the University of Pennsylvania. Philadelphia: Published by the Association, 720 Locust street.

THE

DENTAL COSMOS.

Vol. XXVIII. PHILADELPHIA, MAY, 1886. No. 5

ORIGINAL COMMUNICATIONS.

IS DECAY OF THE TEETH AN INFLAMMATORY OR A CHEMICAL ACTION?

BY W. XAVIER SUDDUTH, M.D., D.D.S., PHILADELPHIA, PA.,

DIRECTOR OF THE PHYS. AND PATH. LAB. IN THE MEDICO-CHIRURGICAL COLLEGE AND DEMONSTRATOR OF HISTOLOGY IN THE PHILA. DENTAL COLLEGE.

(Read before the First District Dental Society of the State of New York, at its Seventeenth Anniversary, December 9, 1885.)

Mr. President and Gentlemen: Dr. Abbott has reiterated in your hearing to-night the same sentiment which he has previously published, viz.,—that decay of teeth, while differing slightly from caries of bone, is essentially a similar process. He finds in decay of teeth the analogue of ostitis. He further says that "the idea of doubting the existence of the fibrils is too preposterous to talk about." And again, both Drs. Abbott and Heitzmann say that by the technique which we use to demonstrate micro-organisms we destroy the bioplasson bodies. I shall confine myself this evening to these three propositions, and that we may correctly discuss Dr. Abbott's position, I take the liberty of quoting from a paper published by him in the Dental Cosmos, on "Caries of Human Teeth":

"Caries of a living tooth, therefore, is an inflammatory process which, beginning as a chemical process, in turn reduces the tissues of the tooth into embryonic or medullary elements, evidently the same as during the development of the tooth have shared in its formation; and its development and intensity are in direct proportion to the amount of living matter which they contain, as compared with other tissues."*

Your attention is first called to the question, Is decay of the teeth an inflammatory action? I use the term "decay" advisedly, because the process of decay is so unlike that of caries of bone that the same word should not be used to designate the two pathological conditions. It has come to be a generally accepted fact that decay

*See the Dental Cosmos, Vol. xxi., April, 1879, page 179.

of teeth is a separate and distinct process. As such, it should be so acknowledged.

Caries of bone, as is well known, is an inflammatory action. Decay of teeth, in so far as the crowns are concerned, is a chemical action: the inflammatory concomitant is a secondary element. In caries of bone the disease begins in the organic substance, while in decay of the teeth the inorganic material is first to be affected. In caries of bone the process is vito-chemical. In decay of teeth the order is reversed, and we see a chemico-vital action.

As regards the erosion of the cement and the dentine of the roots of living teeth, when it does occur, I do not think there is any reasonable doubt but that the process is analogous to absorption of bone, and follows the same order. In caries of bone osteoclasts, or giant cells, are an essential element to the carious process. These cells are probably developed from the white blood-corpuscles which have escaped from the capillary vessels. The nourishment of these cells depends upon the close proximity of a vascular supply. In decay of the teeth all these essentials are entirely wanting. Inflammatory *caries* of enamel or dentine is an utter impossibility when considered from the above stand-point.

Let us see if we can substantiate our position.

The initial lesion in inflammation of bone and cement begins in the vascular system. It may arise from traumatic injury or from an extension of disease from previously affected tissue. An example of the first may be found in cases of fracture; of the second, in constitutional syphilis and tuberculosis. At first we notice a hyperemic condition, which is quickly followed by one of congestion, in which there is an exudation of white blood-corpuscles. The exudation may be resorbed and the equilibrium of the circulation restored. On the other hand, the irritant may be so great, and the existing lesion of such a grave nature, that the character of the exudation may be changed into a purulent condition. In this case the recuperative power of the tissue is entirely overcome and necrosis results. There is an intermediate stage, however, in which the inflammation, once established, is more persistent but less virulent in character. This is designated caries, and a description of this process particularly interests us now, in that we may compare it with decay of the teeth and note the points of dissimilarity.

Dr. Heitzmann holds that erosion is produced by a pathological condition of the fluids of the blood, which liquefies the bone, thus freeing the bone cells, which then coalesce and form the giant cells. He does not satisfactorily account for the presence of giant cells in connection with the absorption of sequestra and other hard tissues in which no living cells exist. Any fluid which has the

power of decalcifying bone or teeth, circulating in the vascular system, would have a deleterious action on other parts of the body. I hold that erosion is produced by the osteoclasts at the point of irritation.

Absorption of tissues is a process which is established by nature for the removal of offending particles, or tissues that have performed their life-work, and is therefore physiological, although the process is excited by pathological means. There is set up in the infected part a condition of over-nutrition, caused by the local irritant. The exuded cells tend to form granulation tissue; rapid cell-multiplication occurs, and numerous cells are found that contain more than one nucleus. These are termed giant cells, or osteoclasts, if the body to be removed is bone. Giant cells are found in diseases where great cellular activity exists; for example, in miliary tuberculosis, syphilis, sarcoma, hyperplastic granulation tissue, and in connection with absorption of bone and other bodies which *nature* wishes to remove. They are developed in all such places, unless the exuded cells are destroyed and a purulent condition produced.

Flemming has established beyond dispute that cell division is by nucleus division. In some instances, however, the nucleus divides and the subsequent cell division does not follow, in which case "giant cells" are formed. We do not know positively just why cellular activity occurs. It is highly probable that the cells are stimulated to increased assimilation of cell-pabulum, since we do not always find giant cells in all cases of over-nutrition, but the fact of the appearance of giant cells in absorption of tissue, whether the tissue contains bone cells or not, pretty clearly establishes the fact that giant cells have an identity entirely independent of bone cells. Then, again, the giant cells or osteoclasts present a similar appearance to giant cells found—as before mentioned—in syphilitic gummata and miliary tubercles. Zeigler uses the terms "osteoclasts," "giant cells," and "resorption cells" as synonymous when speaking of erosion of bone, and says most emphatically that they arise from the exuded blood cells. Exudation *precedes* the formation of giant cells. Giant cells *precede* the decalcification of bone. The bone cells are the last tissues to be liberated in the process of caries; hence they cannot, with any degree of reason, be said to form the resorption cells, giant cells, or osteoclasts.

A description of the process, from Woodhead's "Pathology," will further elucidate the point to which I have reference:

"If the caries is situated in the shaft of a long bone, or in the spongy bone of the alveolar process of the jaw, the trabeculæ will be found dilated and the vascularity of the tissue greatly increased. In a picrc-carmine preparation of a malignant epulic growth we

see lying on the trabeculæ numerous deeply-stained, rounded cells, which appear to be partially imbedded in a layer of pink tissue. The Haversian canals are much enlarged, and at the same time are very irregular; the irregularity being due to a process of excavation extending from the main cavity down into the bone of the surrounding Haversian system. These cavities, whether shallow or of considerable depth, usually contain a number of small round cells (exuded cells or granulation tissue); but, in addition, when the excavation is rapidly progressing, numerous osteoclasts, which lie in cup-shaped cavities, or depressions, are seen. The cup-shaped depressions appear to be invariably associated with absorption of bone, and are spoken of as Howship's lacunæ. The osteoclasts may be very large, may contain many nuclei, and are, in all respects, similar to the giant cells in myeloid sarcoma. The cells and spaces are much more numerous than they are in normal bone, where they are also associated with a certain amount of absorption."

The roots of temporary teeth are an excellent example of physiological absorption through the agency of the giant cells, but these roots are situated in the jaw, surrounded by highly vascular tissue, which latter is absolutely essential to a carious process. In decay of the crowns of teeth these latter essentials are entirely absent, and the development of osteoclasts or "bioplasson bodies" is an utter impossibility. The ability of the blood-vessels of the pulp to furnish the cellular elements for the production of giant cells is not denied, but if giant cells were produced we should have internal caries. Even granting that the erosion of hard substances is produced by the action of a fluid which exudes from the blood-vessels of the pulp, such erosion would result at the point where the dentine first came in contact with such fluid, so that the latter theory will not apply to decay of the teeth, nor will it hold good in caries of bone. To the giant cells or osteoclasts is attributed the secretion of a fluid which has the power of liquefying bone,—they themselves sinking into the cavities which they form. It matters not whether the offending tissue be living or dead, if it is soluble. The process is slower when the tissue is dead. The lime-salts are removed in advance of the organic portions in resorption of living bone. Erosion may begin on the outer side and extend inward; it may commence in the medullary cavity and proceed outward; or both may occur at the same time. "A dead piece of bone inserted under the skin of an animal, and examined a few weeks after, will be found interpenetrated with vascular granulations, and the trabeculæ will be beset in many places with giant cells. The whole process is very similar to that of physiological bone-resorption. * * * This process is peculiarly modified when the foreign substance is firmly

connected with the surrounding tissue; when it is in fact a necrosed fragment of the tissue itself, such as bone or kidney. In this case the first step is the separation of the living from the dead. Langhaus was the first to describe minutely the process by which larger foreign bodies are absorbed. He pursued the subject experimentally by producing extravasations of blood in various animals. He thus discovered the 'giant cell.' Heidenhain also found them in pieces of elder-pith which he had inserted in the abdominal cavity of animals. Ziegler always met with them in connection with his experiments in placing cover-glasses slightly separated under the skin of a dog. Later experiments with sponge-grafting have demonstrated their presence and active agency in the absorption of pieces of sponge."*

In some instances of absorption of bone, in close proximity to the osteoclasts may be seen osteoblasts building new bone. It is by this after process that bones once formed are enlarged. The osteoblasts on the outer side are adding to the circumference, while the osteoclasts are enlarging the medullary or marrow cavity. The development of the antrum of Highmore may be cited as another example.

No one would think of attributing this action to a pathological condition, yet the absorption is accomplished by the same agency that operates in the removal of bone in caries. It is an undisputed fact that cells have the power of secreting acid fluids to subserve the purposes of nature, and in claiming this function for giant cells we do not go beyond the domain of physiological action. The process of absorption is a purely physiological one, in so far as the removal of the tissue is concerned. The *irritant*, however, that excites the cells to the secretion of the fluid is without doubt pathological; but the action of the cells thus stimulated is physiological. To admit that absorption is accomplished by a pathological fluid supplied directly by the blood-vessels, would be to admit that the process of development depended upon a highly abnormal condition of the fluid of the blood, and that a well known physiological condition is pathological. There can be no doubt that cellular activity may be induced by different agents; but no matter what agent incites the process, the result is always the same, provided the other conditions remain the same.

Nature works through well-known channels to accomplish her ends, and resorption of tissues is one of her many processes. When pathological ends are arrived at, the initial irritant is pathological. In caries of bone it may arise from constitutional disease, such as miliary tuberculosis, in which disease it has been pretty conclusively shown that the irritant is the tubercle bacillus. In caries

* Ziegler's "Pathology."

accompanying syphilis it has not been proven what the initial vice is, but late discoveries point to a micro-organism. Suffice it to say, in general, that in every case when pathological results are obtained cellular activity arises from some irritant having a local expression at the point where the caries is produced,—in which case the caries is the indirect and not the direct result. I cannot look upon it in any other light than that the specific vice of syphilis and tuberculosis acts as the local cause of irritation. It is the old story of circumlocution and removal of a foreign body,—a ball in the flesh or a sequestrum of bone, etc. The presence of the irritant gives rise to a perversion of the equilibrium of the circulation, and the localization of the congestion in the immediate neighborhood of the cause of irritation. This increased flow of nutrition is not in itself sufficient to account for the increased cellular activity, both as regards cell multiplication and function; for we have congestion many times without the formation of giant cells or the production of acid secretions. No; there is back of all that can be observed some innate principle, which lies in the cells themselves, that leads to these special attributes,—the "ego" in the cell itself, if you please, which turns the local irritant into a cellular stimulant.

Inflammation of dentine may result from traumatic injury, fracture, abrasion, or decay. We will not speak of pericementitis which may extend to the dentine of the root; it differs in no manner from extension of periostitis, the pericementum being the counterpart of the periosteum.

We will confine ourselves to that portion of the tooth situated above the gums; claiming that the conditions in the decay of that part are entirely different from those in the root. In caries of bone the initial lesion is an inflammatory process, in which inflammation precedes erosion of the osseous structure. Now, on the other hand, in decay of the teeth the order is reversed, and erosion antedates the subsequent inflammation. As we have seen, caries of bone depends upon a highly organic and vascular condition of the surrounding tissue; in fact, a typical inflammation is always dependent upon such conditions. Now, the inflammatory process seen in connection with dentine is of a very low grade, because of the small amount of organic tissue found in dentine. Mind, I do not speak of inflammation of the pulp, but of the dentine itself. As regards inflammation of enamel, *I have nothing to say, since to my knowledge none exists.* And right here comes in a marked difference between those who look upon decay as a vito-chemical action and those who hold that the process is just the reverse, viz., chemico-vital. Those who hold to the inflammatory view of decay claim that there is a direct calcification of the organic or cellular tissues in the development of

the dentine and enamel. I think that I have offered conclusive argument to the contrary in the pages of the DENTAL COSMOS, and so will not inflict them upon you here, but refer you to the November and December numbers for 1884.

That Drs. Heitzmann and Abbott hold the theory that inflammatory processes depend upon a large per cent. of organic tissue is evidenced by the fact that they have tried to formulate a theory of development that will fit such preconceived ideas of decay. They have entered through the wrong door. They should have built their teeth first, and afterwards torn them down.

A man once started on a wrong theory naturally seeks to bend every appearance in support of the position he has taken and prove its correctness. Thus it is that so many erroneous conclusions are reached by those who reason from preconceived ideas. Dr. Abbott claims that he has seen a *fine* net-work of reticular substance left after decalcifying enamel. Now, I have tried faithfully to preserve and demonstrate this "reticulum." I have taken teeth fresh from the mouth and put them directly into Müller's fluid, handling them with as much care as I would nerve-tissues. After several days I ground sections, not allowing the tooth to dry. After grinding I placed them in alcohol to remove the acid, and then stained them by the best technique known. I failed to discover any "reticulum." Again, I have taken sections thus prepared and decalcified them under a cover-glass on a slide on the stage of a microscope, carefully watching the process from time to time. *Results negative.* The fluid used was one-half of one per cent. solution chromic acid.

Again, to avoid all possibility of error in technique, I imbedded sections of freshly-ground teeth in celloidin, and decalcified them in a one-half of one per cent. solution of chromic acid, stained and afterwards examined them with a Zeis one-twelfth hom. oil im. lens, without being able to demonstrate any organic tissue. By the last-named process it was not possible for the reticulum to disappear through faulty technique. The celloidin, acting as a perfect imbedding mass, was not affected by the acid in the least degree; nor did it hinder in the process of staining, for it is well known that it is more permeable to stains than tissue itself. Further, previous to decalcifying the section, I placed it on a slide, and drew on the reverse side of the slide, with a writing-diamond, the outline of the section. This I used to compare the former outline of the enamel with, by placing the section on it to study. I could thus tell exactly where the reticulum should appear. I did not allow the enamel to be entirely eroded by the acid. The line of demarkation where the decalcifying process stopped was well defined, and no appearance of organized or reticular tissue was to be seen between that portion of the enamel and

the line drawn on the back of the slide which marked the periphery of the enamel before decalcification. On the strength of these and numerous other experiments, made in decalcifying enamel, both in mature and developing enamel, I deny the existence of such a reticular substance.

There is another point of dissimilarity between caries of bone and decay of teeth,—viz., the two processes do not give the same reaction when sections of each are stained with picro-carmine. This fact is mentioned by Dr. Miller, who says that "any one who has given time to the study of inflammation, particularly of bone or cartilage, will at once be impressed with the fact that there is not the slightest similarity between it and caries dentium. Furthermore, the action of different coloring matters upon carious dentine furnishes information of considerable interest; for example, picro-carmine colors the simply decalcified, otherwise unchanged, basis-substance pink or red, while the distended tubules or round or oval cavities, filled with débris and fungi, are stained yellow. This reaction is in marked contrast to that of pulp-tissue, periodontium, bone cartilage, etc." I have often noticed this point of difference, and can fully agree with Dr. Miller. Here again comes in the need of broad experience in the action of the different stains in the various pathological processes.

Differential diagnosis by means of stains is a point well-known to those who are conversant with the different chemical reactions of tissues. It is by reason of these variations that we are able to obtain different colors from the same stain in a section which contains more than one tissue. In accordance with this knowledge we can, with a considerable degree of certainty, use stains as aids in diagnosis.

The result of inflammation in bone is aggressive, and is very apt to be followed by loss of bone-tissue. Inflammation of dentine is a defensive process, and through its action barriers are thrown out to stop or hinder the advance of disease. This is well known to every observing dentist, and I need not stop to enter into its discussion except to mention the translucent zone and the development of secondary dentine. In my opinion, enamel is nothing more or less than a coat of mail supplied by nature to protect the dentine, by furnishing a hard surface, and to answer the process of mastication. The *presence* of any considerable amount of organic material that would entitle it to the dignity of accrediting to it an inflammatory action would be just so much against the proper fulfillment of its office. Nature, when left to herself, develops a beautiful and symmetrical object, perfectly capable of subserving her purposes. But, then, you say, why does not enamel resist decay? You might with equal propriety ask why do we sicken and die? Simply because we have

transgressed nature's laws. God in his wisdom created man physically perfect. Man in his weakness has perverted this nature, and disease has followed as a natural consequence of his transgressions. The nearer we can put ourselves in harmony with nature the better able shall we be to interpret her creations. If we enter upon our investigations without preconceived ideas, with open and receptive minds, we shall find that many of the processes which we are trying to make out as intricate and obscure will be plain and easy to understand.

The normal condition of the fluids of the mouth is neutral or alkaline, and any deviation from this state is pathological. Enamel was not intended to resist pathological conditions. It was created to fulfill the requirements of nature when the surroundings are normal. Decay of enamel is the result of the melting down of the lime-salts that constitute it, by an acid condition of the saliva. This pathological condition of the secretions of the mouth frequently accompanies some form of general disease, as diabetes, gout, or gastro-intestinal disorders. It is also often observed in parturition, which, by reason of our present way of living, has come to be reckoned among pathological conditions. Morning sickness is an almost constant accompaniment of parturition, and there is seldom any attempt made to neutralize the acid fluids of the stomach, which are so frequently found in the mouth at such times. Local diseases of the gums or mucous membrane of the mouth often give rise to acidity of the secretions. Pathological conditions of the glands that empty into the mouth, and acid foods and medicines, without doubt play an important rôle in decay. I think that sea-sickness has a great deal to do with the rapid destruction of the teeth of foreigners (servant girls) which is noticed soon after their arrival in this country, rather than the oft-repeated explanation of change in habits and diet. The fluids of the stomach are normally acid, but are *decidedly pathological* when brought into contact with the teeth for any great length of time. I have never seen any attempt at cleanliness evinced by steerage passengers after paying their debts to Neptune, and I think that all will admit that the use of the tooth-brush is an art that is acquired after their arrival in this country, if learned at all. The idea that all foreigners have good teeth is fallacious. I saw more toothless women in Europe last summer than I ever saw in America in the same length of time. The latter appearance, however, may be partially accounted for in the fact that the masses in America can better afford to have lost teeth replaced, and do so.

Above all the before-mentioned conditions which favor decay, I consider the most active agent to be an acid developed at the seat of decay by acid fermentation. Dr. Miller, of Berlin, has very conclu-

sively shown that this fermentation is produced by micro-organisms. He has isolated twenty-two separate forms, and has cultivated them sufficiently to classify them and note their principal reactions, whether acid or otherwise. He says, "Sixteen produce an acid reaction in a solution of beef extract, pepton, and sugar, and for the rest the results were not satisfactory; sometimes the reaction being acid, at other times neutral or alkaline, depending upon the material used for their culture. Some which have an acid reaction in a fermentable solution give rise to an alkaline reaction in non-fermentable solutions." According to Dr. Miller, "decalcification is produced chiefly by acids resulting from the action of these organisms upon certain of the carbohydrates in the human mouth, while the peptonization is produced either by the direct action of the protoplasm of the organisms upon the decalcified dentine or by a ferment which they produce." Three years ago I gave considerable time to the study of micro-organisms found in cavities of decay, staining them by the best-known methods at that time. I succeeded in satisfying myself that no micro-organisms ever penetrated the dentinal tubuli beyond the point of decalcification. The dentinal tubuli are impervious to the entrance of these organisms while they are in a healthy state. As a contribution to this part of dental discussion, I presented these slides, with others, at a lantern exhibit given before the Illinois State Dental Society, and stated my convictions on the subject at that time. These were ground sections. I have since cut sections of the decalcified mass found in cavities, and demonstrated several of the micro-organisms figured by Dr. Miller. My sections also fully confirm his statements regarding their presence in the tubuli of this portion of decay. I can fully substantiate what Dr. Miller says, viz., that "micro-organisms can, and often do, not only distend separate tubules, but push whole tubuli aside, and these foci are the points figured by Dr. Abbott as 'bioplasson bodies.'"

For the demonstration of micro-organisms of decay we take as large a portion of the soft decalcified mass found in the cavities of decay as we can detach by aid of a broad, hoe-shaped, or other suitable excavator, and place it in alcohol. After the water has thus been removed we imbed in mucilage or celloidin upon cork, and cut sections with a microtome or razor. These can be cut quite thin, as they are completely decalcified *by the acids of the mouth*. After cutting sections, place them in an aqueous solution of any aniline dye, preferably fuchsine. After staining, place in absolute alcohol and remove excess of stain; then dehydrate in oil of cloves or cedar, and mount in balsam. The only acids that come in contact with the specimens are those found in the cavity of decay. The methods necessary for the examination of these micro-organisms are about the

simplest of any in use in the study of mycology; and their demonstration the easiest of all the forms we are called upon to study. For some forms of bacteria, however, the methods are more difficult, and their demonstration has taxed the knowledge of our best chemists. Among the most difficult to study have been the tubercle bacillus and the bacillus of lepra. Spores have always been extremely difficult of demonstration, but are now pretty generally understood, thanks to the untiring efforts of such men as Koch and Hueppe.

The bacillus lepra, spores, and tubercle bacilli can be put into a twenty-five per cent. solution of nitric acid, then through two separate baths of absolute alcohol, and yet hold their stains,—provided the staining fluid which contains the sputum or spores is brought to a boil or left for twenty-four hours. It is the knowledge of these properties of bacteria in general upon which we base our assertions that certain foci indicate micro-organisms. But it is not essential that we depend even upon this knowledge. We can take portions of the suspected material, while it is fresh, and cultivate it upon gelatine or other suitable media. After cultivating it through several generations, until we have produced a pure culture, we can prepare a cover-glass, stain and study the isolated organisms. But even this is not sufficient to establish the fact of their being the active agents in decay of teeth. The demonstration of the persistent occurrence of these organisms is of very little import unless the investigator cultivates them and produces decay by their action upon teeth placed in the culture solution. Dr. Miller has done this by the action of some of these organisms on dentine, which I cannot distinguish from decay produced in the mouth. And, further, he has by difficult chemical analyses proven that the special acid concerned in decay is lactic. In this latter direction he has gone farther than most mycologists. Not only is it necessary to produce decay by the fungi, but the destructive acid must also be determined.

I have studied nearly all the pathogenic bacteria in tissues, and have *cultivated* quite a number of the non-pathogenic, together with a few pathogenic forms, and so feel capable of judging the character of the work done by Dr. Miller. Very few are aware of the immense amount of labor involved in the study of micro-organisms. My reason for quoting Dr. Miller so extensively on the point under discussion is that I have not sufficiently studied the special fungi concerned in decay to offer an opinion unsupported by corroborative testimony. I believe in the reliability of Dr. Miller as a scientific investigator, and my belief is based upon the scientific manner in which he has done his work, and the uniform willingness he has shown in allowing others to see the slides and cultures from which

he has drawn his conclusions. The fact that he is quoted by such an author as Ziegler shows that he is regarded by his colleagues as an original and trustworthy investigator. Dr. T. Mitchell Prudden met Dr. Miller last summer in the laboratory of Dr. Koch, and speaks very highly of his work. I have in my possession a culture of a comma bacillus which was discovered in the mouth by Dr. Miller, and which has received the name of Miller's comma. The standing of a scientific man is in proportion to the honesty and industry with which he works, and I think that I have now cited points enough to prove that Dr. Miller may be safely quoted as reliable authority on the subject of decay.

In conclusion, it may not be inappropriate to speak very briefly of the position of dentistry in regard to scientific research. I fear that we do not as a body realize the importance of putting all our statements on a scientific basis, and submitting them in a scientific manner. We are too apt to base our theories upon information about different phenomena, instead of building them securely upon active knowledge of visible results. Gentlemen, this may have done in the past, but it will not do now. Scientific investigation is constantly changing the points of view from which we have been in the habit of regarding various pathological conditions; it keeps on presenting new suggestions and new discoveries. To meet this advancement it is required that we subject all our theories to the crucial test of careful experiment. Nor is this all: we must be able to *show* the results from which we draw our conclusions.

The day is passed when simple assertions or drawings of other men's work will suffice to establish a scientific point, and our profession will never be the power it might be until as a body we recognize the true value of the experimental investigation of actual facts wherever these are accessible to study, and demand that all pathological questions connected with our work shall be pursued from a scientific stand-point, and the visible results presented for investigation. If we would be forceful men in the domain of science we must present facts for authority, not authority for facts; we must freely give the methods by which our knowledge is augmented, and allow others to study and weigh our work. Above all must we be prepared to modify our views or abandon them if errors should be discovered and plainly pointed out.

Let us take as capital examples of the true scientific spirit the researches of Dr. Koch and his school. The preparations upon which their inferences are based have been freely shown to others, and they have done their utmost to extend the boundaries of medical science by publicly revealing new facts as they have gathered them from various experiments. Compare the attitude of

these men with that of Dr. Ferran. He rose like a meteor and sunk as rapidly, not because he was incapable of performing the experiments in which he was engaged,—for he had studied in some of the best laboratories in France and Germany,—but simply because his methods did not bear the stamp of true scientific investigation. He refused to demonstrate the facts upon which his theory was based, and consequently scientific opinion was against him.

These thoughts are offered as a mere outline of the direction which conscientious inquiry in dental pathology is now taking. The attendance here this evening shows the interest that is being awakened in scientific dentistry, and I trust that it will be the means of exciting an increased desire for scientific information. Many difficult problems are now awaiting the patient student. He who would solve them must first learn his a, b, c's in the field as taught in normal histology; his x, y, z's in general pathology. Then, having just learned the use of the tools which will constitute him a novitiaté in science, he may pass into the field of special pathology, including mycology, where he will find at least a partial key to the solution of some pathological problems. Until he has done this no man is entitled to high rank as a scientist. Let us, then, as a dental profession aspire to true scientific attainments, and prove ourselves worthy of the title of a scientific profession.

DENTAL CARIES.—VIII.

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(Continued from page 199.)

PART THIRD.—SEQUELÆ.

1. Exposure of the Normal Pulp.

Preliminary Considerations.—The third stage of dental caries includes the exposure of the pulp. The term exposure as here used does not mean simply an uncovering of the pulp. It means the subjection of that organ to unaccustomed influences which must sooner or later be detrimental to its normality. Decalcification may proceed to the pulp, but if putrefaction has not closely followed, it may still be amply protected from external influences by the horny layers of the dentine matrix which form its covering. Such a pulp is not exposed, although the disease has reached it. And we are justified in classing it with non-complicated cases, *unless* in our manipulation directed to treatment we are obliged to remove this covering. Again, decalcification may not have reached the pulp, and there is actually a layer of normal dentine over it, but so thin that it has ceased to be protective either against thermal changes or pressure.

Such a pulp is virtually exposed, and the case requires the consideration of complicated caries. It must be remembered that we do not in this article deal with those cases of exposure which have endured long enough for the pulp to take on some pathological change, because in such an event the mere exposure becomes a minor consideration, thrust into the background by the more prominent lesion. We treat here only of pulps normal in their integrity but abnormal in their surroundings,—a condition that frequently presents, and one that the operator must be ready to recognize and to take advantage of.

Appearances Presented.—The normal pulp is of a grayish color, readily distinguishable from the surrounding dentine. The point of exposure is almost always one of the cornua, or horns, and in the molars and bicuspids it is usually the buccal cornu that is the first to be exposed.

The size and shape of the exposure may vary somewhat, but it is not common to see a large exposure with the pulp still in a normal condition. The most frequent appearance is a minute, round or oblong spot, slightly differing from the dentine in color and having a somewhat translucent appearance. It is not at all easy to describe, but is readily distinguished when once seen, although one may be sometimes deceived by a small particle of decalcified dentine which has been left attached to the wall of the cavity.

Diagnosis.—It requires at times acute diagnostic perceptions to determine whether a pulp is or is not exposed in the surgical significance of that term. Moreover, these perceptions are of a kind not readily taught, coming only through accurate experimental knowledge of the parts. Where doubt exists greater safety lies in the course of treatment applicable to exposure.

With one exception, there are no *symptoms* due to this condition, when the pulp yet remains normal, that are not also found in simple caries. That one is pain caused by the pressure of food impacted in the cavity. A patient says, in answer to inquiries, that when food gets into the cavity the tooth aches until it is removed. It can be safely decided that that pulp is exposed, although it may not respond to thermal changes because of the softened dentine over it acting as a non-conductor. Pain upon suction is also a symptom of some diagnostic value.

Cold air and drinks produce acute temporary pain in these cases, but so do they also in simple caries, and the symptom is of little value therefore in teeth of normal sensitiveness, but in low-grade teeth it should always excite suspicion, because they usually do not respond to irritants until the pulp is exposed.

All symptoms due to pulp lesions indicate exposure as well, but

they are not symptomatic of the condition under consideration because the pulp is no longer normal.

Having elicited by judicious inquiries what information is available, and being still in doubt, the next step is an examination, and this should be conducted with gentleness and consideration. Patients come to us shrinking with fear. It should be our special care to allay this and to show them that their fear is unfounded. I do not suppose that it is amiss to say that three-fourths of the pain inflicted by the average dentist is entirely unnecessary, and at this first interview the intelligent operator will endeavor to save his patients all possible pain and impress them with his caution and skill. The cavity should first be syringed with *lukewarm* water and loose pieces of decay removed; then moistened with carbolic acid, creasote, or solution of cocaïne,* and dried with the warm-air syringe. Now, with a sharp excavator, remove the superficial layers of decalcified dentine, always cutting from the pulp towards the periphery of the cavity. If the contents of the cavity are soft, disintegrated, and of a whitish gray color, remove all down to sound tissue, bearing in mind the shape of the pulp and using due caution as it is approached. But if the contents are of a brownish color and of horny consistence, that can be peeled off in tenacious layers, remove only sufficient for the retention of the filling and the proper shaping of the cavity. If there is an exposed pulp beneath, it should not be disturbed, as this is the best capping that can be placed thereon.

Having now a clean, dry cavity, in the large majority of cases diagnosis is easy, and the vision, direct or aided by the magnifying glass or mouth-mirror, can readily detect the small, grayish white spot which once seen is always readily recognized. If still in doubt suspected places can be touched gently with a pointed instrument of drawn temper,† with the prospect of eliciting a doubt-removing response. This touch must be exceedingly delicate and guarded. It cannot safely be used with those patients who through unusual lack of courage or self-control cannot remain passive. I say to all patients preparatory, "Be quiet and I shall not hurt you; move hastily and I might do so." The instrument should then be bent as desired and the point touched to the suspected spot. It must not slip or slide. Such a movement is not only dangerous, but the response elicited, if any, is of no value. The touch should be with a gently increasing pressure, watching also the patient's eyelids for any indication of pain, when it should be suspended at once. If no such indication occurs the fingers will readily detect that the instrument rests upon solid material.

* In naming remedies I shall always give them in the order in which I prefer them.

† Jeweler's "pivot" broach.

I place much confidence in this method for obscure cases, and I have rarely been deceived by it or given my patient anything but the slightest twinge of pain. Of course, in proportion as the cavity is inaccessible the difficulties are increased, but the operator has always the mouth-mirror for reflection, and probes can be bent to any desired shape. Skill in their use will overcome all obstaclés.

Treatment.—There are two methods in general use of treating the exposed normal pulp,—the first by capping, which contemplates its preservation and protection; the second by devitalization, which contemplates its death and removal, relying upon the periosteum for the support of the tooth.

Capping.—I have but little confidence in this treatment, except when the exposure is very slight. My failures have far outnumbered my successes. It is but fair to state, however, that a great many operators of excellent reputation claim to have had a very large measure of success. The methods used are various, but the underlying principles are the same in all. The requisites to a successful operation are absence of pressure upon the pulp, compatibility of the material therewith, and non-conduction, or protection from thermal changes. The materials that have been used are almost numberless,—lead, platinum, quill, spunk, court-plaster, paper, oxysulphate of zinc, oxychloride of zinc, oxyphosphate of zinc, gutta-percha, plaster of Paris, sandarac varnish, lacto-phosphate of lime, oxide of zinc with creasote, and many others. Bearing the principles in mind, it is easy to select the material. A good method is to take a bit of quill or writing-paper, cut to the desired size and shape; moisten it with balsam of fir or sandarac varnish, and having previously dried the cavity, stick it over the exposure; over this flow the oxychloride or oxysulphate of zinc, mixed very thin. Another is to mix the oxide of zinc or phosphate of lime with carbolic acid, creasote, or oil of cloves, to the consistence of thick cream, and draw this over the exposure with a blunt-pointed instrument. Gently absorb the surplus moisture with spunk or cotton, and then flow one of the cements over this and allow it to harden. There are many others equally good that I have no room to mention. The operation of capping an exposed pulp requires the *utmost delicacy of manipulation.* The slightest pressure will defeat the object sought. I think it is better that the entire cavity, after the capping is in place, should be filled with the oxyphosphate cement or gutta-percha, which can afterwards be cut out sufficiently to admit of a more permanent filling. When time is not important the latter should not be done until there is a reasonable certainty that the operation has been successful. A capped pulp should always be regarded with anxiety as to its future, and this in proportion

to the size of the orifice and difficulties encountered. Such a pulp may die in one month, or it may live two or three years and then die. Whenever this accident does occur the tooth is in a worse condition than in the beginning, for periostitis and probably abscess will be the result.

It would be a great boon if some method of pulp-capping could be introduced which would be successful in the hands of all capable operators, but that is probably too much to expect even in the light of past discoveries. It is greatly to be regretted that dental surgeons are compelled to destroy so many pulps. The remedy lies in the education of the people as to the necessity of early attention to carious cavities.

Devitalization.—There are two methods of destroying tooth-pulps. First, by direct surgical procedure. Second, by preliminary cauterization.

There is no doubt but that teeth the pulps of which have been extirpated by surgical means are left in better condition as to healing and future complications than is the result when a cauterant is used. But as this procedure is excessively painful,—so much so that but few patients will submit to it without an anesthetic,—it has been abandoned largely for the second method.

The usual manner of operating is by broaching. A barbed nerve-broach of soft iron and suitable size is dipped in carbolic acid and introduced along the wall of the root-canal to its apex, *the barbs turned from the pulp.* It is then rotated several times, and the pulp, entangled by the barbs, is withdrawn with the instrument. If the tooth have more than one root-canal, each requires the same treatment. In molars and bicuspids it is necessary to first remove the bulbous portion of the pulp, which can be done with a sharp, spoon-shaped excavator.

In open roots where direct access can be had the following method has been advocated: A piece of wood, cut to the shape of the canal, is moistened with carbolic acid, driven quickly alongside of the nerve to the apex of the canal, and then withdrawn.

Cauterization is in general use. It can be made painless in all but exceptional cases, and is so generally successful that it leaves but little to be desired. There are occasional cases of "soreness" following this method, but I believe it to be due to improper or insufficient preliminary treatment in the majority of cases. Given an exposed *normal* pulp, this method is painless, and complications very rare. It requires from one to four applications, and preferably from two to four weeks' time. If sufficient time is not given, pain on extirpation will be severe. The medicamentum is arsenic, although the result can be accomplished with carbolic acid, nitrate of silver,

tincture of iron, and other preparations of like character, but the time required is very much longer, and, with the exception of the first-named, the pain is also greater. The amount of arsenic usually recommended for an application is one-twentieth of a grain, which in bulk would be a portion of the dry powder about the size of a small pin-head. But this is vastly more than is necessary, although not sufficient to be dangerous. The greater the quantity used the less easy it is to keep it within the limits of the cavity, and it will act with the same readiness upon the surrounding tissue that it acts upon the pulp. The operator should use, therefore, as small a quantity as is consistent with convenience and accuracy of application. There need be no fear of an insufficiency. It is almost incredible how small a portion will accomplish the result. The danger of using arsenic has been greatly overestimated. In reasonably careful hands there is absolutely no danger to life, and if it is used in sufficient strength to act as a caustic there is no danger of absorption. This should be emphasized. The profession has been too frequently stigmatized as using this drug in a dangerous way. It is time that its members should *know* to the contrary and be ready to refute such charges.

We do not yet know how arsenic acts, except that it is a caustic of great power whose action is not confined to the superficial portion of the tissues. Dr. Ingersoll's theory * seems to me to be the most plausible one yet advanced.

There are two methods of employing arsenic in general use,—as a powder and as a paste. The powder is the ordinary arsenious acid or commercial arsenic, and the paste is composed of equal parts of arsenic and sulphate of morphia made into a thick paste with creasote. It has been suggested that cocaïne be incorporated with arsenic for this purpose. I have not tried it, but should expect little benefit from such a combination.†

There is also a fibrous material used for this purpose; it is a proprietary article, the formula for which is not given.

To use the dry arsenic, take a small pellet of cotton not larger than a pin-head and tightly rolled; moisten it with carbolic acid or creasote, and touch it to the powder. Lay this directly over the exposure, and overlay it with whatever material may be decided upon. Or, a moistened probe can be used as a means of carrying the powder to the cavity with even greater accuracy where it is easy of access. The paste is used by taking a small pin-head pellet on the point of an instrument and placing it in the cavity.

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* Transactions Iowa State Dental Society, 1885.

† Cocaïne is not absorbed by inflamed tissue, and where no inflammation exists it is unnecessary.

As to the material used to retain the arsenic *in situ*, my preference is for cotton whenever the cavity is of such shape as to retain it. It may or may not be saturated with a solution of sandarac in alcohol. I do not consider it necessary, save as it may make it more easily retained in place. If the cavity is not retaining and cannot be made so without much pain, the oxychloride of zinc mixed pretty stiff is of excellent service. Gutta-percha and the phosphate of zinc are not so good, because considerable pressure is required to adapt them, and this militates against the comfort of the patient. In making an arsenical application the cavity should be dry, and must be maintained so until it is completed. In the class of cases we are now considering no pain should follow the application, and if pain does occur it may fairly be suspected either that there is pressure upon the pulp or that the diagnosis is incorrect and that some pulp lesion exists. I have already alluded to the action of arsenic upon surrounding tissues, and I wish to again utter a caution against this danger, *especially* as regards approximal cavities. The arsenic must be placed *in the cavity*, and must not escape, for it will certainly destroy all the soft tissue with which it comes in contact. No fear need be entertained, however, of its solution in the saliva entering the cavity and by this means extending its influence. It is very sparingly soluble, and such a solution would have no caustic effect, so that its mechanical retention in the cavity is all that is necessary.

Twenty-four hours is usually sufficient to devitalize the bulbous portion of the pulp even in a molar, but there need be no hesitation about leaving it a much longer time if it is desirable as a matter of convenience. Indeed, I prefer that it should remain longer rather than to incur the risk of giving pain in removing this portion, and therefore usually prescribe one week. This time having expired and the patient returned, the stopping should be removed and the cavity syringed with lukewarm water. Now take a rose bur in the engine, for a molar tooth, about number six bur gauge, and for the other teeth about number four. With this carefully open the pulp cavity until it is fairly exposed to view, and then by a few rapid rotations *without pressure* remove all the bulbous portion of the pulp. In cavities on the distal surfaces of molars it is sometimes very difficult to do this, and if it cannot be done satisfactorily an accessory opening should be made—in upper molars through the articulating surface, and in lower molars through the buccal surface—of sufficient size to admit of easy manipulation, say bur gauge number sixteen.

It is sometimes a matter of urgency that the operation should be completed at this sitting by broaching, but it is only occasionally

that it can be done without much suffering, and such premature efforts are to be discouraged. The treatment is therefore continued, and the previous application repeated. I am an advocate for long time in these cases. It redounds greatly to an operator's credit that he removes pulps without pain, and it can be done in ninety per cent. of his cases if he does not hurry them. One week is not too long for the second application, giving the patient permission to have the outer layer of cotton replaced daily if desired for the sake of cleanliness. At the end of this time an examination should be made with a very fine hair-like instrument,* passed slowly up the side of the root-canal. If much pain is given, continue the treatment for another week, but in placing the arsenic work it up into the canal, being careful not to push it through the apical foramen,—a not very necessary warning, however, as it is difficult to get it far into the canals.

These nerve-fibrils in the root-canals are sometimes very tenacious of life, and many applications are necessary, but if plenty of time is given it is very rarely necessary to make more than four, covering as many weeks.

In regard to using cements or gutta-percha in this operation for retaining the arsenic, it must be borne in mind that long time cannot be safely given if the stoppings are tight, as the retention of the elements of putrefaction is productive of periostitis and abscess.

A symptom of considerable uniformity, and which I think indicates sloughing at the apex, is a slight tenderness of the tooth and soreness upon tapping, but rarely to pressure. It is of considerable diagnostic value, and indicates that the time is near at hand when the nerve-fibrils can be withdrawn with little or no pain.

There is a wide difference in teeth and in individuals as regards the action of arsenic. In some instances one application and two or three days' time is sufficient for an easy extirpation, but I believe such cases to be exceptional. The weather has also an influence. Pulps die more slowly and teeth are more apt to become tender in cold than in warm weather; in damp than in dry weather.

Extirpation.—The pulp having no longer any vitality, the next step is its removal. This is usually best accomplished by broaching after the manner already described. At times an extremely simple operation, it is frequently very difficult, and many unsuccessful attempts may be made. The difficulties are principally due to the inaccessibility of the root-canal, either through the location of the cavity or because of the small size or tortuous course of the canal. Sometimes a few fibers of dry cotton on a "pivot" broach

* Donaldson's nerve-bristle without the hook, or a very excellent one can be made of piano-wire.

(temper drawn) will entangle it when the ordinary nerve-broach will not. Nerve-hooks I have found of little value, although occasionally successful with them. If all attempts are futile, the cavity may be closed with some temporary stopping for two or three weeks, when the fibrils will have disintegrated or shriveled up, and the canal can then be wiped out with cotton on a broach. I do not think any danger is to be apprehended from thus leaving these fibrils in the canal for the prescribed time or even longer, although it has been so taught. I have never seen an untoward result from such a course continued any reasonable time. Patients should be instructed to report at once if any soreness of the tooth occurs.

It has been recommended that all small canals be enlarged until easy of access. To do this graduated four-sided broaches are used. I prefer jewelers' broaches of drawn temper, rotated in the canal, beginning with the "pivot" size, following this with the "pallet," and then the "joint," which leaves the canal large enough. Some use points of this character or spear-shaped drills in the engine. Such a method is more rapid, but also more dangerous than by hand. A broken drill in a canal is a very disagreeable accident. A drill will not always follow the canal, and a new passage may be formed that complicates future manipulation and may even do damage. The Gates-Glidden drill has an advantage in this respect.

I think it is a little questionable whether the enlargement of these canals is *always* desirable. A very small canal—too small for a fine pivot broach—is rarely the cause of an abscess, even when unfilled, and it is not likely that they are often filled to the apex, although they be drilled. Such being the case, too much interference is not rational treatment. Nature unaided is capable of absorbing or at least rendering innocuous a small portion of pulp remains, and closing the apical foramen. Success is quite as likely to follow trust reposed in her efforts as in self-confident manipulation.

The number of canals in the various teeth are,—in the incisors and cuspids, one; all the bicuspids, except the first upper bicuspid, *usually* one; in the first upper bicuspid, usually two; in the upper molars, three; and in the lower molars, sometimes two broad and flat-shaped, but often four. The anatomical relation of these as well as their anomalies must be familiar to the operator.

The difficult canals, anomalies excepted, are in the buccal roots of the upper molars and in the anterior roots of the lower molars. The first named are in the majority of cases very small, and abscess on these roots is exceedingly rare. The others are quite difficult of access, and abscess is also infrequent. While all reasonable efforts

should be made to fill these canals, I do not think the dentist has committed an unpardonable crime if he has left them to nature's methods. Root-canals are larger in young teeth than in old ones.

(To be continued.)

CORRECTING IRREGULARITIES BY THE "SPRING" OF GOLD BANDS.

BY B. S. BYRNES, D.D.S., MEMPHIS, TENN.

In correcting irregularities of the teeth I have employed in a large number of cases a new device of my own invention which seems to possess many decided advantages over the methods in common use. A brief oral description presented to the last meeting of the Southern Dental Association, held at New Orleans, was so favorably received that it has seemed desirable to communicate the method to the profession at large.

The motive power employed is the "spring" or elastic force of thin gold bands. My preference is gold of 20k. to 22k. fine, and as a rule the thinner the bands the better the result. It frequently occurs, of course, that for special cases or for a special purpose during the progress of any case the band must be doubled in thickness, but this fact does not change the rule as stated. The pressure exerted by the bands is gentle but constant, and the teeth upon which they operate are moved rapidly, with only the slightest inconvenience to the patient. No plates are used, the fixed points for the application of the motive power being supplied by such of the teeth as are suited to the purpose.

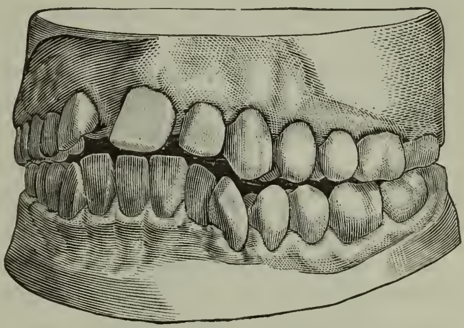
The method of application is in a general way as follows: The fixed points having been determined, the tooth or teeth to be regulated are connected to them by means of a thin gold band. In selecting the fixed points care should be observed to choose teeth which will offer greater resistance to the force to be applied than those which are to be moved will. The band is then manipulated so as to form it into a spring or series of springs so adjusted as to bear most powerfully on the misplaced tooth. Thus, suppose a projecting superior central incisor is to be drawn inward to align properly with the remainder of the teeth in the arch. A continuous gold band embracing the first molars on both sides is fitted around the outside of the arch. With a dull-pointed instrument like a burnisher the ribbon is then pressed into the interstices of the teeth over which it passes, thus forming it into a series of small springs. The incisor being the most prominent point will naturally be most affected by the pressure exerted by the springs, and in a short time it will be found to have moved away from the band so that it is no longer affected by the tension of the springs. As soon as this occurs the

apparatus is removed, the ribbon is annealed, straightened, and a small portion, say a thirty-second to a sixteenth of an inch, as may be required, is cut out of it. The ends are then soldered, and the appliance is replaced upon the teeth, the connecting band being formed into a spring as before. Tension is thus kept up until the tooth has assumed the desired position.

This is the plan of procedure in ordinary, simple cases of irregularity; but the method is equally applicable to more complex conditions. I have not yet seen a case since my adoption of this device where it could not be made to do the work of moving the teeth readily. Sometimes the spring of the band may be advantageously supplemented by other aids, as the insertion of a rubber wedge at points where a particular gain is desired, in accordance with the recognized principle that in regulating teeth the movement is greatest where the elasticity is greatest.

One of the most important points to observe in the treatment of a case of irregularity is to always have the fixture so tight that it is not necessary to tie it on to the teeth. I frequently apply fixtures by degrees: that is, after making a snug fit, force the appliance partially to place, then allow an interval, sometimes of a half hour, before proceeding to complete the adjustment. I find this plan lessens the severity of the operation to the patient, not only because of the rest afforded, but because the teeth seem more inclined to yield, and thus allow the fixture to be placed more readily.

Fig. 1.



To apply the rubber wedge, select a strip of rubber of the desired thickness. Place the gold fixture, which should fit perfectly tight, in position, and insert the rubber behind the band opposite to one of the interstices. Take the ends of the rubber in either hand; stretch it to its fullest extent, and gradually work it to the desired spot; then clip off the ends. Press the teeth forcibly in the direction in which you wish to move them, with one hand, while with the burnisher in the other the band is pressed into the interstices.

Case I. The first case which I shall describe is that of a young lady who at the time she came to me was in her eighteenth year. The condition of her teeth at that time is well shown in Fig. 1. The missing right superior central had been extracted when the patient

was about eleven years old, as the only relief from the unendurable pain following devitalization of the pulp at the hands of an itinerant dentist. To supply the deficiency a partial plate of vulcanite had been worn for the last three and a half years. The remaining anterior teeth of the upper jaw had been gradually forced outward until at the time I first saw them they protruded at an angle of forty-five degrees. In the lower denture the incisors stood within the arch, the cuspids inclining forward. As a result of this conformation the chin was somewhat wrinkled and slightly upturned. The lips wore a constant pout, the mouth being what may be termed "peaked." The molars being the only teeth which occluded properly, the mouth was never naturally closed, and the patient was unable to make an incisive bite.

In treating this case I aimed to compass four principal points: 1st, the destruction of the "peakedness" by producing a broader or more oval arch; 2d, the reduction of the projecting teeth to their proper position; 3d, the improvement of the articulation; and, 4th, the closure of the space caused by the loss of the right superior central.

The last mentioned was first undertaken. For the first two days a heavy band was used to force the ends or cutting edges of the right lateral and left central together. A very thin, narrow gold band was then fitted to embrace the necks of these two teeth, and a wedge of wood was inserted under it on the side toward the cutting edges, causing the teeth to move vertically towards each other. The band being placed around the necks, and the wood spreading it toward the cutting edges, caused very great pressure at the apex of the root. Another band (Fig. 3) was then constructed to move the

Fig. 2.

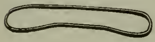


Fig. 3.

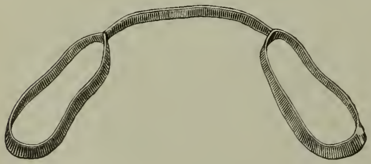
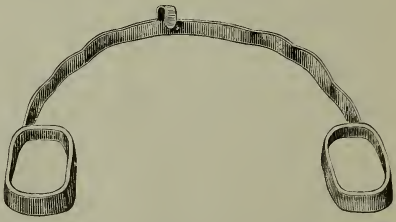


Fig. 4.



incisors backward and bring them into a more vertical position. This was placed in position without removing the first (Fig. 2). It consisted of two bands embracing the cuspids and bicuspids of each side, connected by another band of the same material passing outside of the incisors. The connecting band was then pressed into the interstices between the teeth, and rubber wedges were inserted. This fix-

ture caused constant pressure backward on the anterior teeth, and an outward pressure on the cuspids and bicuspids. The gold band acted as a lever, the lateral teeth as the fulcrum, and the posterior teeth as the weight to be moved. The connecting band was cut and shortened every other day, the patient having a sitting every day to allow the gold to be sprung more as the teeth moved away from it.

At the end of three weeks the narrow band at the necks of the incisors was discarded, its work having been accomplished, and that shown in Fig. 3 was substituted by another, which passed around the outside of the whole arch from the first molar on one side to the corresponding tooth on the other. This appliance (Fig. 4) was required to do but little actual work, its principal office being to hold the gain already made, and to close the spaces between the teeth, which were now about equal in extent, and to bring the teeth to a vertical position. The gold was doubled in thickness over the incisors and cuspids to prevent its yielding while the backward movement was progressing, which would allow the arch to again assume the peaked appearance which the treatment was undertaken to correct. The small hook or catch was to prevent the band from slipping up toward the gum, which it showed a tendency to do when first applied. The patient now wears a similarly shaped band, but only one-third as wide, as a retaining piece, which she removes and reapplies at pleasure.

The treatment of the irregularity in the lower anterior teeth was begun about a week after work on the upper jaw was commenced, and was completed in three weeks. A band, constructed as shown in Fig. 5, was applied, clasping the first molars on both sides, and passing around the cuspids and behind the incisors. A wooden wedge was placed between the incisors and the band, and springs formed by pressing the band into the interstices between the cuspids and bicuspids, cutting and readjusting as before. In two weeks this fixture was substituted by another (Fig. 6). This was a plain band clasping the incisors, with wings tipping upon the cuspids, and having the portion behind the incisors doubled in thickness. A little block of rubber inserted under each of the wings completed the work in a week's time. The wings were then pressed back to hold the gain, and the piece given to the patient to wear as a retaining-plate.

Fig. 5.

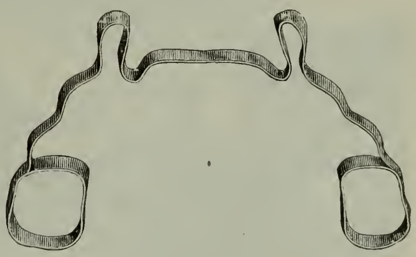


Fig. 6.

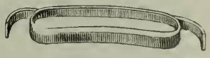
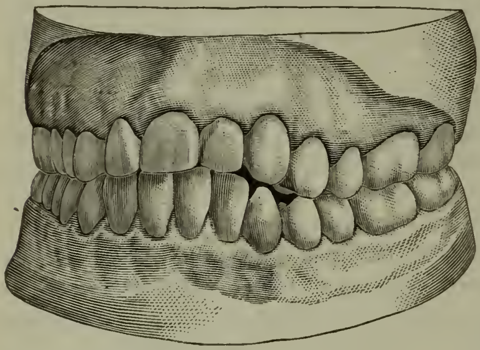


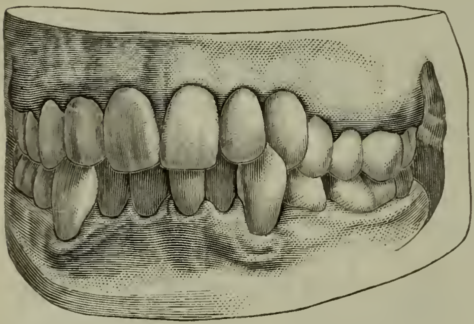
Fig. 7 is an accurate representation of a cast of the mouth taken at the conclusion of the operation. The correction of the irregularities in this case was accomplished in a month, work being carried forward simultaneously in both jaws after the treatment of the lower teeth was commenced. The work of moving the upper teeth was pushed so rapidly as to slightly "spring" the maxillary at the attachment of the compressor nasi and depressor alæ nasi, so that the wings of the nose were pulled laterally inward and downward, causing a slight bulging or bridge on the centre of the nose. But I saw the patient some six months after the case was dismissed, and the muscles had adjusted themselves, and no deformity was visible. The patient then informed me that she had never had any trouble with either of the retaining fixtures.

Fig. 7.



Case II. Patient, a lady, aged twenty-seven. The occlusion of the teeth was very faulty (Fig. 8). The lower cuspids closed in front of those in the upper jaw, giving to the chin an angular shape, and the deformity was becoming more conspicuous from day to day. The dentes sapientiæ were just erupting into a crowded arch, causing considerable pain throughout the denture, and pushing the lower cuspids still further forward. As the wisdom-teeth were well developed, I decided to extract the first bicuspids to make room for them, and this was accordingly done. The threatened trismus disappeared promptly, and the work of bringing the cuspids back into position was begun. Two gold bands (Fig. 9) were applied, one on each side, embracing the first molar and cuspid. The bands were sprung into the interstices on both the buccal and lingual surfaces of the teeth. During the early portion of the

Fig. 8.

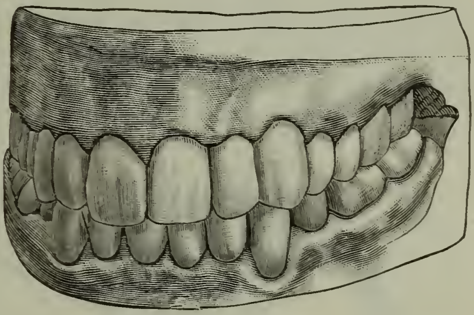


treatment heavy bands were used, which were made to fit tight and forced to place, each cuspid being pressed backward with the thumb of the left hand while the gold band was pinched into the interstices with a pair of root forceps. The molars were capped the first week to permit the cuspids in the opposing jaws to pass each other freely. As absorption proceeds slowly at the age of this patient, it was deemed inadvisable to push the work rapidly, and the bands were therefore cut and tightened only twice a week. As soon as the cuspids were brought back from their inclined position, the case became a very simple one to treat; as the arrangement and shape of the teeth enabled me to put on very tight bands. The treatment was completed in ten weeks. Fig. 10 is from a cast made after the conclusion of the work.

Fig. 9.

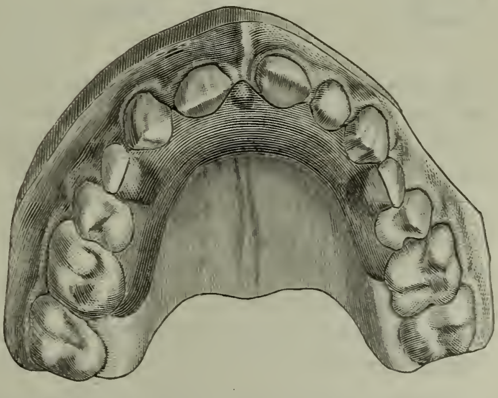
As illustrating the convenience with which the apparatus was worn, I may mention that the patient was a vocalist of considerable merit, and during the whole period of the treatment was enabled to sing with perfect accuracy of tone and enunciation.

Fig. 10.



Case III was corrected in eight sittings. The patient is a lady aged twenty-two years. When about ten years old she fell, striking upon the teeth of the upper jaw in such a way as to knock out the right lateral and dislocate the other incisors, the left central remaining at an angle of 35° after its attachment to the alveolus was renewed. The incisors gradually separated from each other, the space between the centrals at the cutting edges being more than an eighth of an inch. The cuts give a very inadequate idea of the extent of the deformity,

Fig. 11.



which was very marked. Previous to my seeing the case a dentist in Ohio had attempted to bring the teeth into proper position by means of a rubber band passing from the left central over the little lug seen on the plate between the centrals (Fig. 11); but this attempt failed, as the resistance was almost equal to the power employed. The appliance I used in correcting this case is shown in Fig. 12,—a simple gold band extending from the second bicuspid and first molar on the right side as base across the mouth to the central to be moved. Here there were no teeth to be utilized in forming the connecting-band into a series of springs, but this was readily accomplished by crimping the band as shown.

Fig. 12.

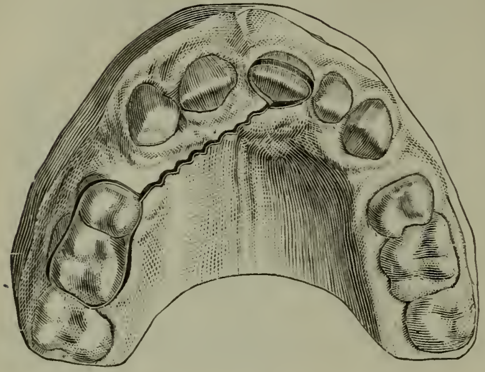


Fig. 13 shows a somewhat more complicated apparatus than any of those previously described. It was used in a case where the right central overlapped the lateral. It illustrates how the method which I advocate may be applied to turn a tooth where the force must be applied directly across the mouth. After the necessary room was provided this fixture was applied. It accomplished its work in four days, after which a retaining device was applied, consisting of a simple band, clasped tightly around the central which had been rotated, and provided with wings tipping on the left central and under the right lateral.

Fig. 13.

There are very few forms of irregularity of the teeth to the correction of which the method I have endeavored to describe may not be applied. So far since I began to use it I have found none, and I have treated many cases. When I explained the method before the Southern Dental Association, Dr. McKellops did me the honor to characterize it as the "simplest and most effectual regulating device he had ever seen." I trust that it may be given a thorough trial, and I am confident that it will bear out all that I have claimed for it.

SEPARATORS.

BY W. A. WOODWARD, D.D.S., NEW YORK, N. Y.

These separators are constructed of a rigid frame or ring of metal, with movable steel blades or points, between which a headed screw is forced. The separator Fig. 1 has been in constant use for the last eighteen months for the rapid separation of bicuspids and molars. It will readily be seen that, as the screw-head is gradually forced between the steel blades A, which are in contact with the teeth to be separated, the blades are practically levers, which, with the screw-head acting on the inclined-plane principle, makes the instrument a powerful one. The distance these blades move apart adapts the separator to a variety of cases, and the sets of blades acting independently is an advantage when the teeth are irregular, one set or side easily fitting a wide space, while the set on the opposite side fills a narrow space. It can be quickly placed on the teeth or removed, and there is little complaint of pinching the gum.

The separator Fig. 2 is a more recent invention, and although intended for incisors and cuspids, is frequently of service for the bicuspids. To adjust it the sliding-bar, B, is pressed closely into the

Fig. 1.

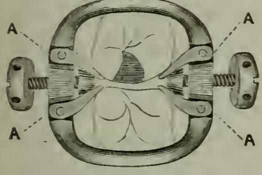
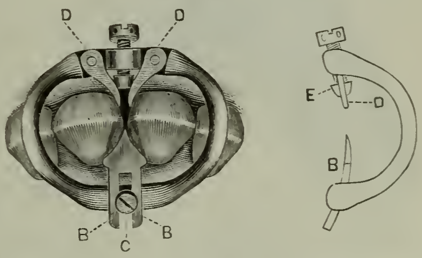


Fig. 2.



approximal space from the direction of the lingual or palatal surfaces of the teeth, and secured with the set screw, C. This will bring the blades, D, of the separator in the same space labially. The screw-head, E, is at intervals gently advanced between the blades, D, which press the teeth apart sufficiently to give access for the insertion of most contour fillings without previous separation by slow pressure. The sliding-bar, B, can be removed, and another substituted, better adapted to the case in hand, or for special cases; for illustration, the crown of the superior first bicuspid is usually broader than that of the cuspid. The bar, B, would fit all the other spaces anterior, but for this one a bar with one side longer than the other, to fit the broader bicuspid, would be more secure and better protect the rubber dam when finishing the fillings.

The results secured by the use of these separators have been very

satisfactory, making many operations possible at one sitting which formerly required separating in advance, and in many cases with much less discomfort to the patient.

REGULATING INDIVIDUAL TEETH.

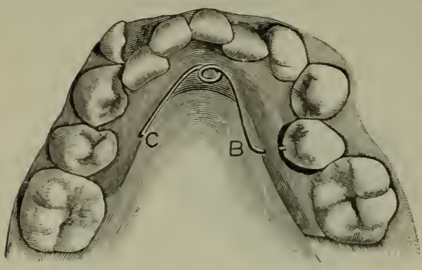
BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

We frequently find a single tooth situated inside the dental arch, and have trouble in contriving an apparatus suited to the correction of such an irregularity. Of the numerous well-known devices for this purpose, many are ineffective or complicated, besides being unsightly and difficult to remove or keep clean.

The illustrations represent some simple appliances which have been thoroughly tested and found satisfactory, in that they do the work effectively, are easy of adjustment and removal, and may be readily cleaned.

Fig. 1 exhibits a second inferior bicuspid of the right side, having a lingual presentation equal to one-half the thickness of the tooth inside of its normal position. The cut also shows teeth in other malpositions, but for our present purpose these are not the subjects of consideration.

FIG. 1.



For this case a thin, narrow, close-fitting vulcanite plate was made, and a hole was drilled through the middle of the plate opposite the center of the tooth to be moved. In the other side another hole was drilled, but

FIG. 2.

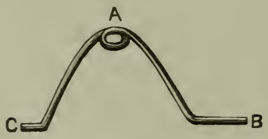


FIG. 3.

not quite through the plate. A suitable spring (Fig. 2) was then made of piano-wire, having a single coil, A, and the ends of its arms bent at about a right angle. One of these ends, C, was cut short to enter the corresponding hole in the plate, and the other end, B, left long enough to go through the plate and impinge on the lingual surface of the bicuspid, leaving a full eighth of an inch between that arm of the spring and the plate, as is clearly shown by

Fig. 1, where the spring is in position to act upon the tooth to be moved. It is obvious that both the plate and the spring may be instantly removed, either for cleansing purposes or to increase the power of the spring by spreading its arms, or to open the coil so that the tooth may be held steady at the point to which it may have been moved.

Fig. 3 shows a spring having two long ends, B B, which are designed for a case in which two such teeth are to be likewise moved in opposite directions, as by a jack-screw; yet with this appliance there is no obstruction to the free movements of the tongue, nor is there any interference with the other teeth, or injury to the teeth moved, or painful pressure on their gingival margins. In fact, the construction, application, and adjustment of these appliances are singularly simple, effective, and controllable.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting, Tuesday evening, February 9, 1886, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

Dr. J. Morgan Howe, vice-president, in the chair.

Vice-President Howe announced the presence of the newly-elected president of the society, Dr. Edward A. Bogue, who, on taking the chair, made a brief address.

[In consequence of the pressure on our pages, we are compelled to omit the address and also the report of "Incidents of Office Practice."—Ed. Dental Cosmos.]

The President. We have with us this evening Dr. Brophy, of Chicago, as our essayist, from whom we will now be pleased to hear.

Truman W. Brophy, M.D., D.D.S., of Chicago, Ill., read the following paper on

The Matrix—A New Form.

When I began to write this paper I intended to confine myself to the discussion of the matrix and its advantages as an auxiliary in operative dentistry. A second thought of the subject, however, impressed upon me the fact that, if my mode of procedure was to be clearly apprehended, it would be necessary to discuss also the more important materials with which to fill the teeth, and especially their use in connection with matrices.

Preparation of the Cavity.—When matrices are employed, the essential points to be observed in preparing cavities are as follows: It is not necessary to remove as much of the tissue at the base of the cavity as is required in preparing it to be filled without the use of the matrix. I regard retaining-pits in these cases as not only unnecessary, but also positively injurious to the tooth, particularly when the pulp is alive. The drilling of these retaining-pits is to the patient the most painful step, as a rule, in the preparation of a cavity. Nor is this all; the metal carried into them renders the pulp more susceptible to thermal changes and thereby endangers its vitality. Slight lateral grooves may be made; but even these I do not consider as essential to retain the gold first introduced. Uneven and overhanging margins of enamel should be removed, and all sharp corners slightly rounded and polished smooth. As a rule the base of the cavity should not be disturbed or materially changed in shape after the removal of the caries and any thin wall of enamel that may be present. The part of the cavity opening upon the masticating surface of the tooth is to be shaped so as to firmly retain the filling.

Filling Materials.—Notwithstanding the fact that earnest and almost numberless efforts have been made by many dental practitioners to produce a filling material which can be easily and quickly manipulated, and which, when introduced into a cavity in a tooth, will remain there many years and preserve it, we are to-day still dependent upon the earth's most precious metal to aid us in the arrest of the ravages of dental caries. While our desire is intense to secure a cement which will not disintegrate in oral secretions, such a discovery has not been made; the cements must be regarded as fit for temporary fillings only, and we must, therefore, turn to a material which is not new and which has stood the test of time. The efforts of dentists who have with apparent enthusiasm claimed to have proved by experiments conducted in chemical laboratories that gold was the most objectionable metal with which to fill teeth have failed to effect a reduction in the manufacture, sale, and use of dentists' gold foil. Its merits are too manifest to be set aside with our knowledge, based on a long, hard-earned experience. The forms of gold and methods of introducing it are almost innumerable. We speak of cohesive and non-cohesive gold, and the discussion of the relative merits of each occupies much of our time and attention. When cohesive gold was introduced, the excellent qualities of non-cohesive gold seemed to have been temporarily forgotten. Later it was restored in a measure to its former place. To-day it is regarded as indispensable. The real difference, in my opinion, between cohesive and non-cohesive gold is that the latter has upon

its surface an imperceptible coating of some substance which prevents it from cohering to the preceding gold.

Prof. G. V. Black, of Jacksonville, Ill., has suggested a simple method of treating cohesive gold to render it absolutely non-cohesive and as soft as velvet. The gold is subjected to contact with the fumes of ammonia. Its surface is thus slightly coated with this substance, and the gold is rendered non-cohesive. It is equal, if not superior, in this quality to any of the foils in the market. If the operator desires to convert it into cohesive foil again, he may do so by annealing it, when the ammonia will be driven off and the cohesive quality of the gold will be restored. Having long ago been persuaded by Prof. Black to adopt this method of treating gold, I am convinced that any cohesive foil can, by this process, be quickly deprived of its cohesive qualities, and will thus be equal to any non-cohesive gold in use.

A common way to ammoniate gold is to prepare the foil as it is to be used. If loosely rolled ropes are employed, they should be cut into pieces of desired size, placed upon spunk in a drawer, in a corner of which a little tin or porcelain box is to be put containing a few drops of aqua ammonia, the fumes from which will be sufficient to speedily accomplish the object desired. If ribbons be used,—a form of gold having features superior to many others, principal among which is uniformity of thickness,—they may be prepared and placed in the ammonia drawer a few minutes, when they will be ready for use.

I have often been unable to distinguish the slightest difference in the working qualities between cohesive and non-cohesive gold as it comes to us from the dealers in dental goods. There are, however, certain brands of soft or non-cohesive gold in the depots which are quite reliable. The ease in manipulating and the certainty of securing a good adaptation of the gold to the margins of the cavity, thereby preventing leakage of the filling, would seem to be a sufficiently strong inducement to lead all to employ non-cohesive gold in the greater portion of the cavity. Non-cohesive gold fills an important—a very important—place in dentistry, and it is a matter of regret that young men pursuing their studies in our dental colleges are not made as familiar with its use as its excellent properties warrant.

Gold and Tin.—The combination of gold and tin as a filling material is by no means new. At the present time, however, it is attracting not a little interest among the best minds of our profession. Tin has long been regarded as a valuable material with which to fill teeth. The chief objections to it are discoloration and rapid wearing away on masticating surfaces in consequence of its softness. It is

claimed that the salts of tin deposited upon the interior of a tooth cavity are antiseptic, and therefore possess value as a prophylactic. Such may be the capability of tin, but the assumption remains to be proven. I am of the opinion that the efficiency of tin as a filling is due to its softness and ease of adaptation to the walls of the cavity, and therefore to its effectiveness in stopping the cavity and perfectly excluding the agents upon the presence of which dental caries depends.

In a paper by Dr. W. D. Miller, of Berlin, published in the *Independent Practitioner* for August, 1884, something of the history of the use of combined gold and tin is given, in the clear and concise style characteristic of that well-known scientist. Dr. Miller asserts that gold and tin combined have been used about twenty years by Dr. F. P. Abbot, of Berlin, with most satisfactory results. Dr. Miller says: "It has, however, been adopted by only a limited number,—owing, no doubt, to a wide-spread superstition that the electricity attendant upon such a filling will in some way or other be injurious to the tooth." After discussing at length the question of electrical conditions, he adds: "We may say, therefore, that neither experimentally, theoretically, nor practically can any good or bad result be expected from the electrical action of a tin and gold filling upon the tooth-bone; neither have we to fear a disturbance of the pulp from the use of tin and gold in any form in the same cavity." (Here, of course, no reference is made to those cases where a large gold filling in one tooth is brought into contact with a large filling of tin or amalgam in the adjoining tooth.) "We, therefore, as far as the tooth is concerned, dismiss the question of electrical action altogether."

Gold and tin are prepared by placing one-fourth or more of a sheet of number four non-cohesive gold foil upon the same sized piece of number four tin foil and twisting them into a loose rope. It matters not if the tin or gold be on the outside. Frequently as much of one metal as of the other is exposed to view. The advantages claimed for the combination of tin and gold are,—that it may be inserted rapidly and with a degree of ease scarcely equalled in the use of other materials; that the presence of a slight amount of moisture does not in the least impair the working properties of the material, nor does it render the filling less permanent. A short time after a tin and gold filling has been inserted both metals lose their identity; the mass expands slightly and discolors,—sometimes becomes quite black, and is converted into a crystalline substance resembling amalgam. The discoloration is *certainly objectionable*, especially on the teeth in a position exposed to view. It cannot therefore be used in the anterior teeth.

Dr. Miller's concluding paragraph is as follows:

"Gold and tin used in the manner first advocated by Dr. Abbot owes its virtues to the ease and rapidity with which it may be inserted; to its marked adaptability; to its freedom from injury by moisture, and to its slight expansion after insertion. It does not owe its many virtues to any supposed electrical action upon the tooth itself."

My limited experience with combined gold and tin will not permit me to speak of its merits as a permanent filling material with that degree of enthusiasm and authority which mark the article from the pen of Dr. Miller, but I am convinced that by filling large approximal cavities with it we may greatly lessen our labor and relieve our patients of the tedium of protracted operations.

The reports of the experiments of Dr. Miller have upon them the stamp of extreme care. I have confidence that the results of his observations are not presented to the profession until he feels assured that he has arrived at conclusions which cannot be successfully refuted.

A distinguished American surgeon, the late Prof. W. H. Van Buren, has said: "The truth flows naturally from well observed facts, and it is wiser not to be too anxious to reason out theories. If we make ourselves sure of the facts, theories will take care of themselves."

The Matrix.—The advance made in operative dentistry during the past twenty-five years has been due, I believe, more to the introduction of the rubber dam and the matrix and their intelligent use than to all the other appliances at our disposal. The rubber is in almost universal use, but the matrix is used, I find, by a very small percentage of the members of our profession. The absence of interest in the matrix must be attributed to a lack of knowledge of its intrinsic merits. Many operators, no doubt, have attempted the use of the matrix, but not being able to adjust and retain it in position to their satisfaction, and moreover finding it inadequate in certain cases, have abandoned its use after their first unsuccessful effort to employ it.

In reviewing the history of the matrix, I find the article published in the DENTAL COSMOS, Vol. xiii., page 169, from the pen of Dr. Louis Jack, of Philadelphia, the first to have appeared on the subject; and justly should it have emanated from this authority, for to Dr. Jack's skill are we indebted for the invention of this invaluable appliance, and to him also belongs the credit of its lucid and minute description. In the DENTAL COSMOS, Vol. xiii., page 354, we also find an article from Dr. W. H. Cooke, of Cleveland, Tenn., commending the use of matrices, and in Vol. xiv., page 70, another article from Dr. Jack describing their use in difficult cases.

Within the past year a loop matrix has been introduced by Dr. Frank Creager, which has some admirable features.

On October 13, 1885, at the annual meeting of the Pennsylvania Association of Dental Surgeons, a matrix, the invention of Dr. Miller, of Altoona, Pa., was exhibited. It is made of steel which is bent upon itself. It is used by placing it between the teeth to be filled, first springing it apart so that it will exert sufficient pressure against the teeth to hold it in place. When gold is used a wedge is placed between the ends, so shaped that it will press the lower edges of the matrix against the cervical border of the cavity.

No other articles to my knowledge have appeared on this subject, but frequent reference is made to matrices by authors of papers on operative dentistry, and by those who have participated in the discussion of the subject of the filling of approximal cavities; and, as I have previously remarked, the arguments against the matrix, presumably for the reasons I have stated, have predominated. Personally, I must admit that, while I read the papers of Dr. Jack with great care and immediately began the use of the matrix, I soon abandoned it, because I found it difficult to retain in position; besides, I felt uncertain as to the margins of the cavities being perfectly filled. No doubt my inability to use the matrix satisfactorily in many cases was due to incomplete knowledge of Dr. Jack's methods. While, in the main, the Jack matrix was a great improvement in operative dentistry, yet some of the methods practiced by Dr. Jack in adapting it to difficult cases consumed too much time, and were far too complicated and laborious for general practice. I have reference to the making of vulcanized rubber appliances upon the models of the teeth so as to form the matrix or missing wall of a cavity in the distal surface of a molar where the posterior molars are absent.

Recognizing the difficulty in producing such appliances, and the necessity of constructing one for each individual case, thereby involving a great loss of time, I have been experimenting during the past few months with a view of securing something more easily adjusted and more universal in its application. The matrix I have designed is in the form of a band, and made of thin spring-tempered steel, and therefore is easily adapted to the irregular form of any tooth upon which it may be placed. The band is doubled or thicker on one side, and is penetrated by a screw, the blunt point of which rests against either the buccal or lingual wall of the tooth, and, when set up by means of a watch-key or a lever, fixes the band firmly in place. (Fig. 1.) Having separated the teeth so as to wholly expose the cavity to view, and to enable the operator to restore the carious approximal surface to its natural contour, a band matrix is selected large enough to fit the crown of the tooth quite loosely; the

thin steel of which the band is made readily passes between the teeth which are close together and up to the margin of the gum; the screw is then set, and the approximal cavity is thereby converted into a simpler one. These matrices are especially adapted to bicuspids and molars, so that any wall of the two classes of teeth mentioned may be more easily restored by their use. When applied to the lower bicuspids and molars, it is usually better to set the screw on the lingual wall, since this wall is straighter than the buccal and the screw consequently does not tend to slip upward. In the case of the upper teeth the screw should be set on the buccal surface of the tooth, for the reasons just given. (Figs. 2 and 3.) When the buccal wall only of an inferior molar is to be restored by filling, the matrix is not usually required, and it is in this class of cases that the band is most difficult of adjustment. The buccal surfaces, how-

FIG. 1.

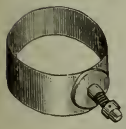


FIG. 2.

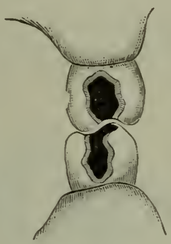


FIG. 3.

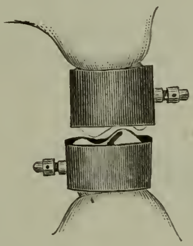
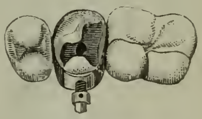


FIG. 4.



ever, of inferior bicuspids, when the mesial or distal surface is also involved, may be easily filled and given proper shape, with rare exception, by the use of the band matrix (Fig. 4.); so also with any surface or wall of the superior molars and bicuspids.

In filling approximal cavities which dip deep down under the gums much difficulty is experienced in retaining the rubber dam in position so as to exclude moisture. I have derived great satisfaction and have been highly successful in using a band matrix with an annex designed especially to meet such emergencies. (Fig. 5.) It differs from the others in having a lamina extending gumward corresponding in width to the cavity to be filled. After the rubber has been placed upon the teeth, the band is placed upon the tooth to be filled, and forced beyond the cervical margin of the cavity, which is clearly exposed to view, carrying the ligature and rubber before it to the desired point, when the screw, which holds the band firmly in place, is to be set. The moisture is thereby successfully excluded, and the operator is enabled to easily restore the contour of the tooth by filling.

In cases where a considerable portion of the buccal and lingual walls of molars and bicuspids has been lost, I have found the thin

band inadequate to the requirements, inasmuch as it will draw into the cavity when the screw is set. I have, therefore, constructed a matrix increased in thickness or of double thickness on both buccal and lingual surfaces, so as to make the band stiffer and give form to the outer surface of the filling. The same result may be obtained by making use of an annex to the thin band, made of German silver, which may be bent to resemble the form of the letter U and fitted to the tooth, leaving only the sound approximal wall uncovered by it. (Fig. 6.) An extension toward the gum is made, rounded to correspond with the depth of the cavity at the curved margin of the cervical wall, and to exert pressure upon the rubber dam and gum tissue and to prevent the ingress of moisture. This piece is then placed inside of a band of sufficient size to readily slip over the tooth to be filled, and is secured to it by bending the lower margins of the annex so as to embrace and clamp the lower portion of the band, or by means of little pins passing through both inner piece and band. Although I have had the holes made in the band and annex for the reception of the pins, I have thus far found no difficulty

Fig. 5.

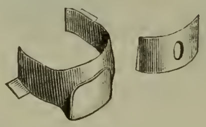
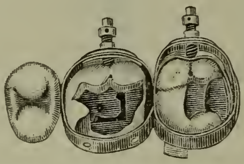


Fig. 6.



in retaining the annex in position by the simple means first described.

When the rubber dam and matrix have been adjusted as hitherto described, the operation of inserting the filling is very simple as compared with the laborious method of operation without the matrix. It is my practice to begin with a large pellet of non-cohesive gold foil, or combined gold and tin (the methods of manipulating these materials are the same), and to carry it between the matrix and the cervical extremity of the cavity, thus lapping it and making the filling perfect at this point. The fact of its being carried between the band and the tooth, and that it is held steady by this means, makes the introduction of retaining-pits or grooves unnecessary. The mallet is used after the first few pieces have been put in place, and continued to the finish. After the cavity has been one-third, one-half, or two-thirds filled with the material first introduced, cohesive foil is forced into it by means of deep serrated pluggers of wedge shape. After the first layer of cohesive foil has been condensed, finer serrated pluggers may be used, and when the filling is nearly finished, number sixty cohesive foil is malleted in place to form the surface of the filling. The wedge-shaped plugger, ser-

rated on the point and on all sides as used, and first brought to my notice by Dr. Benjamin Lord, of this city (New York), is the most valuable instrument with which I am acquainted for manipulating non-cohesive gold, tin, or the combination of these metals.

The band matrix will yield to a sufficient extent to admit of the introduction of gold between it and the cervical border and approximal wall-margin of the cavity, thus enabling the operator to secure a perfect adaptation of the filling and contour it to any extent required. If excessive contour is desired it can be effected by loosening the band slightly while the masticating surface is being approached.

Résumé.—Soft or non-cohesive gold is more desirable than cohesive gold for cervical margins and for the first half of the filling, owing to its ease of adaptation to the tooth-walls and to the rapidity with which it can be inserted. The masticating surface should be made of cohesive foil, my own preference being given to number sixty or higher.

Gold and tin, in consequence of its ease of manipulation, seems to be an excellent material with which to fill the base of larger approximal cavities in posterior teeth; owing to its discoloring, however, it is not suitable for anterior teeth.

The band matrix is simple; it is easily applied to a tooth, and it is securely held in place. The dentist can reduce the time and labor in operating; can easily obtain perfect margins by carrying his gold between the band and the edges of the cavity, and can restore the contour of the tooth to any extent required.

By the use of the band matrix distal cavities, when adjacent teeth are absent, can be more expeditiously and satisfactorily filled than by any other method.

By the use of the band matrix and annex the large approximal cavities which dip deep down below the surface of the gum can be filled with comparative ease, and in less than one-half the time consumed in filling them without it.

The matrix which has been submitted and described is not the offspring of theory, but an outgrowth of actual practice. It has been tested in a great number of cases, and is presented only after months of experiment and experience. I may be permitted to add that professional friends in my own city and neighborhood have also used it, and in every instance, I believe, with satisfaction and success.*

* See a paper on "Crystalline Gold, its Varieties, Properties, and Use," by Dr. W. H. Dwinelle, of New York, published in the *American Journal of Dental Science*, Vol. V., No. 2, New Series, April, 1855, where the first mention is made of the use of the matrix. In January, 1875, a loop matrix was invented by Dr. George S. Staples, of Sherman, Texas. See also an article on "Clasp and Band Matrices," by Dr. J. A. Woodward, in the DENTAL COSMOS for June, 1885, page 335.

The President. Gentlemen, you have heard the paper with which Dr. Brophy has favored us. The subject is now open for discussion. We have with us a number of gentlemen from other cities, and it will afford us great pleasure to hear from them.

Discussion.

Dr. Shepard. Are these matrices in the market now?

Dr. Brophy. They are not yet in the market; as soon as I have perfected one or two points that I think can be improved I will have them manufactured and placed on sale by the dealers.

Dr. Shepard. From my examination of these samples it seems to me that the mode of tightening the band by a screw is a very good one. It commends itself to my judgment without trial. One of the difficult things in connection with most band matrices is to get them firmly secured.

Dr. J. L. Williams. I congratulate Dr. Brophy upon his improved method of tightening the band.

Dr. Niles. I think the idea of a loop running up, in cases where the cavity extends under the gum, is excellent. It facilitates the adjustment of the rubber dam and helps keep the cavity dry. This matrix seems especially desirable in those cases.

Dr. Dwinelle. I think that we are all under obligations to Dr. Brophy for his very interesting article read to us to-night. He has reduced to a system well-nigh perfect a principle that has been long in use. While I claim to have originated the idea or general principle of the matrix, I did not perfect it as has been illustrated this evening, or as Dr. Jack, of Philadelphia, has done. I simply claim the idea and the application of the principle practically, so that the results accomplished at that early day were as complete as those produced now. Any one who is disposed to take up the journals of thirty or forty years ago will find many new-old discoveries which will both astonish and interest him. Gold combined with tin was used, as Dr. Rich will certify, by Dr. Spooner in this city fully fifty years ago, in all of its possible changes and differences of manipulation. There is no doubt but that this combination is a good one. I should think it would be a good material to use at the cervical borders of fillings. That is the most important part of the cavity to be filled. There was a time when we had no cohesive gold foil. Occasionally a gold-beater would, by over-refining his gold, produce a "sticky" gold, as he termed it, regarding it as a misfortune. Not until Dr. A. J. Watts and myself were engaged, some thirty-two years ago, in experimenting for the purpose of developing crystal gold, was it known that it is one of the inherent and peculiar characteristics of gold that when it is reduced to a state of absolute purity it is cohesive. This we found invariably to be the case,

absolute purity only insuring the highest degree of cohesiveness. It must not only be chemically pure, but electrically pure, which result we gained by a species of electrolysis. Having gained this absolute standard of purity and cohesiveness, we had a basis of action, so to speak, from which we could manufacture foil of any degree of cohesiveness or non-cohesiveness by alloying with metals or by other methods. That was the first time a systematic method of producing cohesive foil was known. The cohesiveness of foil already made may be reduced in many ways. Coating it with ammonia is a method which is new to me to-night; but there are many others that answer as well. Time and exposure will do it as well as anything. But there is no doubt, and I feel that all the older operators will justify me in the declaration, that so far as gold foil is concerned there is no better material for filling teeth than soft, velvety, kid-like gold. Its softness and malleability, and *manipulatability*, to coin a word for the occasion, render it adaptable to the walls of the cavity as nothing else will. The use of cohesive gold foil is very desirable, as we know, but we have to use it with great care or it will kink up and form arches and lattice-work, which impairs its integrity. But, when used as a supplement to other forms of gold, there is no doubt of its excellence.

Dr. Perry. I am a little shy of matrices of any kind in making gold fillings, as I like to know just what I am doing at the margins of my cavity, and that is not always possible when the view is obstructed by a matrix. I like to be able to drive the gold over the margins and "nip" it off with the instrument, for then I know I have made a tight fit. Along the cervical wall a matrix may be trusted, for there soft gold may be used and the point of the plugger comes squarely against the wall; but as the buccal and lingual borders are reached, cohesive gold must be used, and as the plugger-point does not strike squarely, I prefer to have my view of these margins unobstructed. I often make a compromise, therefore, and use along the cervical border a narrow matrix made from thin brass or phosphor-bronze, and held in place by the jaws of one of my separators, as shown by the cast which I here present. In some cases I shape these matrices so that they reach above the cervical wall, and serve to hold the dam in place, as is done by the annex described by Dr. Brophy. These matrices leave about one-half or two-thirds of the margins free, and enable me to work rapidly and accurately. Sometimes I use them of full width, holding them in place in the same manner with the separator, and using the lead mallet to bulge the matrix and bring the filling to full contour. They certainly possess the advantage of leaving a filling so well shaped that but little finishing is necessary.

I think there can be no doubt but that for plastics there is a great advantage in using some form of a matrix. The wonder to me is that they have not been more generally used for this purpose, and that one so efficient as this shown by Dr. Brophy should not have been thought of before.

Dr. J. N. Crouse. I am always delighted when I can take the opposite side of a question. Since my arrival in New York I have visited a number of dental offices, and in all of them have seen about a peck of clamps, separators, matrices, and a variety of other things, all novelties to me. I have been quite interested to learn where they get all the material from which to make them, and find that they are made cheap, generally of home construction, and from such articles as old files, pieces of copper wire, rubber-dam, pine sticks, or any thing that the dentist has no further use for. With my method of operating I have but little use for anything to hold the gold while I am putting it in. I calculate to place the gold properly and keep it there,—though, to be sure, it may not always stay. I just had a note from a patient of mine who is in New York temporarily, and who like myself always steers clear of strangers, asking me to come to see her, for a filling had come out of one of her teeth. So, fearing some of you might have heard of it, I make this acknowledgment, that some gold fillings don't always stay. The question in my mind is whether they stay better or worse for having used these contrivances. I don't like to differ with my friend Brophy, especially as he particularly requested that I should back up his paper when I got here, and I promised to do it; still I have to discuss this subject on its merits, and I cannot commend the use of what I consider useless accessories.

Dr. J. W. Clowes. The paper of this evening has two distinct parts,—the one refers to filling materials; the other to a convenient method of applying them. I speak to the subject of materials, and the better to express myself shall employ two incidents of practice. Several years ago a young lady came to me for an annual inspection. Since early childhood her teeth had been under my care, and the result of judicious culture was seen in dentures of marvelous beauty. In pleased possession, year after year, she had brought them, faultless and without blemish, in review before me. But now a change had come. Along the cervico-labial portions of her upper front teeth were discovered pits of softened dentine and enamel, white to intensity and super-sensitive to the touch. Horror-struck at this sight, I still had hope of saving them with gold. In the most precise manner I excavated and filled these pits, only to find after several months a white ring of extension around the virgin gold. The saving processes were again applied with like result. Subse-

quently oxyphosphate of zinc was employed, and it soon disappeared by solution and the brush. Then my patient inquired why I did not fill her teeth with *amalgam.* Startled at so grave a proposition, it took me some time to reply that "really I did not know what else to do," and doing it, with her approval, she still retains her teeth in safety and peace.

The second incident of practice relates to the mouth of an aged lady who came to me recommended by a friend in whose family I had labored for three generations. Examination revealed a remarkable instance of transverse grooving upon the teeth of both jaws, which I declared an act of denticide by her own hand, and drew from her the question as to what she should do. My patient was a lady of wealth and refinement, had employed none but the best dentists, and her fillings were invariably of gold. Some courage was requisite to answer her, and I said: "Are you unalterably prejudiced in favor of gold as a filling for your teeth?" She replied, "My friend bade me to have no opinion of my own as to what should be done, —that I was to leave all to you without question and without prejudice." Then I explained my purpose to fill her teeth with a plastic substance called *amalgam*—a material that would be efficient and humane above all others, and that the very habit which had brought the grooves might still go on, under changed conditions, to preserve and brighten and make comely. These pits were acid creations,—the action of muriated tincture of iron upon the lime of the teeth. The grooves came from a like cause, supplemented by the brush, which cut out channels deep in the softened bone.

Dr. R. R. Andrews. The subject has interested me greatly, and I hope to be able soon to supply myself with some of the matrices which the essayist has introduced this evening. I have been in the habit of using matrices, and with a great deal of success. I take a strip of copper almost or quite as thin as writing-paper, and cutting a section that will go nearly around the tooth, bind it there after the rubber dam has been adjusted, with floss silk, which I pass around the matrix four or five times. That flattens out and makes quite a substantial backing for the thin copper. With a burnisher, I then press the matrix away from the portion of the cavity toward the masticating surface; my object being simply to have it aid me in filling the cervical portion of the cavity. The sides of the cavity are then in plain view, and I often remove the matrix after building up the filling a short distance. Dr. H. A. Baker, of Boston, has suggested having the copper silver-plated, thereby illuminating the cavity. I have used the plated ones, and like them very much.

Dr. Chas. R. Butler. Like Dr. Crouse, I feel that I must speak on the contrary side of the question. I wish to indorse one point that

Dr. Perry brought before you, in reference to wide and narrow matrices. Dr. Jack has been very successful in the use of his style of matrices. Possibly others have; but, however much or little skill I may have been able to exercise in the department of operative dentistry, I have never succeeded in making that style of matrix serve me. One objection that has been urged against the use of tin and gold in approximal cavities is that it blackens. That discoloration is of very little consequence if the disintegrating forces are headed off and the teeth saved. I saw some fillings on the other side of the water that were made of amalgam with copper in it, and they were as black as ink. I examined them with great care. The tooth-substance was very little if any discolored; and so far as I could discover there was no recurrence of decay at the margins of the fillings, although the teeth were of that class in which you might expect to find it recurring. The fillings had been in some years. Dr. Bogue will probably remember the case.

The folding of tin with gold foil I regard as a bad practice. The result of my use of it somewhat after the manner of Dr. Palmer, of Syracuse, has not been satisfactory. The tin seems to disintegrate, leaving the gold standing, and gives a ragged looking surface. I use tin or textile metal along the basal boarder of a cavity, but without any gold mixed with it, making a square division or section of tin and then adding gold. I think, gentlemen, that with careful manipulation you will find better results following that method than you will get by mixing the tin and gold as suggested by the essayist.

Dr. S. B. Palmer. With reference to the remarks of Dr. Butler, on the combination of gold and tin, I will say that it is not my present practice to use it as described by him. Experience has taught me that when the two metals are systematically combined a chemical process similar to slow fusion takes place, by which an alloy is formed, unlike either metal, and nearly as hard as amalgam. I have obtained the best results by using No. 4 gold and No. 3 tin, one leaf laid upon the other in alternate layers to make the thickness required, then cutting into ribbons the width most convenient. This distributes the gold and tin evenly. In rolling two or more sheets into the rope form, several thicknesses of tin are liable to come in contact, in which case the tin, instead of forming an alloy, will be eroded by galvanic action, and thus present the uneven surface mentioned by Dr. Butler. Whether I use gold and tin for lining cavities or for entire fillings, the same proportions are observed. By the use of cylinders made by rolling ribbons cut from the foil, as already described, at least one-half of the amalgam now used could be dispensed with. Instead of the silver-plated copper

matrix, referred to by Prof. Andrews, I use pure silver, which when annealed becomes very pliable, though I generally prefer to pass it through the rollers, and use it without annealing. It is bright in color, and answers the same purpose, without plating.

Dr. Brockway. Many of those who have spoken on the use of matrices in making gold fillings recognize the difficulty of making a perfect joint at the cervical wall of the cavity. I think that difficulty has beset every one who has used the matrix, and I wish to ask if it could not be overcome by the use of a thin layer of amalgam spread on that surface and filling upon that with gold? Is there any valid objection to such a practice? I can see none. I have made a number of such fillings, and they have proved very satisfactory.

I have noticed the disintegrated condition of the tin and gold fillings which has been alluded to by Drs. Palmer and Butler. Some years ago I made several such fillings, but I subsequently found that they failed at the cervical margin. Not knowing how to account for this, I simply abandoned the practice. Had I known then that the use of a simple *layer* of tin and gold, as suggested by Dr. Palmer, would have prevented that disastrous condition, I should have saved myself much mortification.

The President. Dr. Crouse, may we hear from you in your Chicago style?

Dr. Crouse. I don't know what my Chicago style is, but I must say that the dental profession of New York seems to be going plumb crazy on this subject of matrices. I cannot see any advantage in the use of the matrix. To be sure, you do not have as much overlapping gold to dress off at the margin, but is there not danger that you will have too little, and consequently be unable to get a perfect joint? I am not so ignorant about the use of the matrix after all, for I have tried it, and that is why I am like my friend Perry, who said he was very shy of it. Of course, there are improvements in these things, and the improved ones are the most likely to cause failures. I expect it will be with the matrix as with many other inventions; a lot of poor fillings will be made by those who use it, and the fellows who abandon it first will be the smartest—unless I except the fellow who don't use it at all. I am not sure but the nearer perfect you get your matrices to adapt themselves to the walls of the cavities the more likely you are to have failures in your fillings. When you come to dress off the gold at the margin of the cavity which the plugger did not perfectly condense, but which the matrix held while you were putting in the filling, I think you will be disappointed, and wish you had relied more upon your skill and less upon the matrix. I may be crazy, but it seems to me that the

matrix men are more so in running this business so far. It may be a very good thing, if you can get it on and off in an hour or so, to give shape to a gutta-percha filling. I want to say that I stick pretty close to a tried method,—a method which if properly followed gives a good gold filling, nicely shaped and with good margins and contact. If there is anything in New York better than that I am going to stay here until I get it. Of course, it will not stand hydrochloric acid. But physicians can easily administer hydrochloric acid, if they must, without having it come in contact with the teeth. Our physicians are educated, and have their patients take it through a glass tube. I have taken hydrochloric acid with great advantage, and I don't think my teeth have suffered any of the evil effects that have been spoken of by my friend Clowes. If all the evil comes from the administration of hydrochloric acid, or tincture of iron, or muriatic acid,—and they all come under one head,—it certainly ought to be easily remedied. It is not necessary for this great Odontological Society to be meeting month after month to find a remedy for that trouble. Turn it into a missionary society, and go from office to office and teach the medical practitioners how to administer these medicines.

Dr. Brophy. In regard to the critisims made by Dr. Perry as to the difficulty of adjusting the filling material to the margins of the cavity, I would say that when this matrix is in position the walls of the tooth are so exposed to view that the gold can be carried over and laid on to the cervical margin and condensed there with as much certainty as it could be done with the matrix off. It is not so with a matrix that is wedged in between the teeth. If you wedge something against the edges of the cavity, of course you cannot introduce the gold as easily and with the same perfection that is possible when the margins are free and visible. Along these walls the gold always laps over to some extent, and by this method you have much less excess to finish off. It will be carried beyond even the normal contour of the tooth; and in some cases it is better when carried beyond that normal contour. The band is constructed to fit the neck of the tooth, and is narrower, of course, at the neck than it is at the masticating surface. I do not think there is a gentleman present who is more afraid of matrices than I was after my first experience of a few months, and I have constructed this one so that I can see the margins of the cavity and know where my gold is placed. I promised Dr Crouse one of these instruments, but owing to the difficulty of getting them made I was unable to keep that promise. He said he wished to try one, that he might explain to the gentlemen of this society what success he had had. Dr. Crouse says the great number of clamps, matrices, separators, etc., exhibited and

used by New York dentists have made him sick. Gentlemen, a man is always sick when he is at sea.

Dr. Dwinelle. I think if we leave this subject of hydrochloric acid and the muriate tincture of iron in its present condition we will remain under a cloud and an imputation of ignorance, where, for one, I am not willing to rest. I do not want our friends to go back to Chicago with the impression that our chemistry, therapeutics, and materia medica are so entirely at fault as would appear from the remarks of our worthy and excellent friend Dr. Clowes. He would give us to understand that most of our patients are constantly under the deleterious influence of the muriate tincture of iron; that this is their normal condition, and that as a consequence their teeth are all being ruined. Erosion of the teeth is a mystery to this day, though the subject has been discussed a great deal during the whole of my professional life, and every now and then we have a sort of spasmodic way of reviving it. Our worthy friend, Dr. Darby, of Philadelphia, recently came over and read to us a delightful paper on the subject. We fancied the problem was about to be solved. But he left us, as he acknowledged, as much in doubt as ever. I had the opportunity of presenting a case at that time wherein cause and effect followed each other closely and conclusively. Erosion of the teeth is attributable to acid foods, and condiments, the astringent acids especially. But these acids are so quickly neutralized by the fluids of the mouth, which in a normal state are alkaline, that we cannot hold them responsible for all the destruction we see. I think it is a sufficient reply to Dr. Clowes's theory—and there is not a more honest man in the world, if he is a little cranky on this subject—to say that the worst cases of erosion ever known have occurred in the mouths of persons who *never* took a particle of muriate tincture of iron.

Dr. S. B. Palmer. Mr. President, I believe that the taking of iron often produces the constitutional changes referred to when given without an acid. Frequently during gestation there is an acid condition of the secretions. So we should not cast the blame wholly upon physicians, nor trust to giving iron through a tube, if it is true that iron alone has the same effect in constitutionally changing the secretions.

Dr. Niles. There are many acids that will produce the effect that Dr. Clowes speaks of. The acid of the lemon, lime-juice, and common vinegar all produce the same effect upon the teeth, especially if immersed in them for a time. I have had a case under my observation the past two weeks, where a physician gave the patient lemon-juice, and directed her to gargle the throat with it every half hour. That treatment was continued for one week, and it is need-

less to say that the teeth were pretty thoroughly softened. I learned that the old physician had been in the habit of prescribing this treatment for sore throat for seventeen years. His attention was called to the injury he had done, and he not only denied that his gargle did this, but informed me that I was an alarmist and an extremist. In reply, the patient was instructed to immerse a tooth in the lemon-juice, and after twenty-four hours take it to the physician. That experiment convinced him that he had been doing wrong for seventeen years. A simple alkaline wash would have neutralized the acid and avoided the whole trouble.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

[Seventeenth Anniversary, December 9, 1885.]

President Carr. The discussion of Dr. Williams's paper will now be opened by Professor Frank Abbott, of New York.

[Dr. J. L. Williams's paper was published in our February number, page 65.—Ed. Dental Cosmos.]

Dr. Frank Abbott. Mr. President and Gentlemen: Truth is what we are looking for, no matter whether it comes from Philadelphia, Berlin, or elsewhere. It is what we have been striving for during the last eight or nine years, and many of us very hard indeed. Possibly there may have been considerably more work done in this direction by several other gentlemen present than by the reader of the paper. That our opinions differ widely and emphatically as to the facts in the case, considering our different stand-points, needs not, perhaps ought not, to be doubted. That Dr. Miller, or anyone else, can place under the microscope a section of a carious tooth, whether the caries be artificially produced or otherwise, and make it appear as if it were full of organisms, I have no doubt. But there is one truth that we want to remember, in the first place, which the doctor has kindly referred to, namely,—*that there is organic material in the teeth.* He does admit that there is some twenty-two per cent. of organic matter in the dentine, and that there may, possibly, be a little in the enamel, although that is doubtful. I am glad he has gotten along so far as to admit that it is *not* a solid crystal of phosphate of lime. I have so many times seen, in sections of enamel magnified under the microscope 1000 to 1500 diameters, what certainly seemed to be fibers so clearly demonstrated that the idea of

doubting their existence appears almost too ridiculous to talk about. To go back to the question of organization. Bone-tissue, as you know, contains about thirty-three per cent. of organic material (including the matrix into which the lime-salts are deposited, the reticulum of living matter, blood-vessels, etc.). There is an inflammatory condition of bone called osteitis, a disease known to all surgeons, and every man who is familiar with the pathology of bone-tissue understands it. Now, in dentine we have a tissue which presents a little less organic material, it is true, but can anyone sustain the position that because of this slight difference in organic material inflammation cannot occur in it? This is limiting pathology with a degree of certainty quite startling. True, it has no regular circulation, so far as blood-vessels proper are concerned, but that there is a kind of circulation in dentine that we have not yet seen, nor yet understand, I do not doubt for a moment. As an evidence of it we have from the beginning of the deposit of lime-salts in the odontoblasts, through the entire life of the pulps of teeth, a constant accretion of inorganic material in that tissue. A similar process is constantly going on in all the osseous structures of the body. If there is no organic or living matter in the enamel, I would like to know how it is that when the pulp of a tooth is dead the enamel loses its peculiar life-like appearance and looks in every way like dead tissue. How does it change in that manner if there be not something going on in the way of death of the tissue, and how can this occur if it is a solid "secretion" of lime-salts? I was unfortunately called out for a moment, and did not hear all that was said in the paper in reference to a recent article of mine upon the subject of the pathology of the enamel of human teeth. There are certain conditions, of course, which predispose teeth to decay, and that their environment has much to do with it there is no question. All that is necessary to say in answer to the reference is that a perfect enamel will withstand an unfavorable environment much longer than an imperfect one. This *fact*, I think, even Dr. Williams will admit.

There is one question in reference to the presence of micro-organisms in the deeper portions of caries that has troubled my mind quite considerably, viz: If great numbers of them are left in teeth when they are filled, as must be the case if they are present, as is claimed by some observers, when a reorganization of the disorganized territory of dentine takes place,—a process the results of which are observed by all clinicians,—what becomes of these organisms? Do they enter into and form a part of the reorganized dentine, or do they quietly steal away? They must be dependent upon *outside nourishment*, or it is fair to presume that they would live

and thrive under a filling as well as before the filling was introduced. This would seem to "checkmate" the theory that they live upon the organic portion of the tooth, and that they necessarily "secrete" lactic acid.

Mr. President, the opening of a discussion of this kind is a little awkward, particularly after so lengthy a paper as we have heard this afternoon, and one that requires so much thought in its discussion. Perhaps I may ask the privilege of adding a few words later on, or at the close, but I will leave the matter as it is for the time being.

President Carr. We will now have the pleasure of listening to Dr. W. Xavier Sudduth, of Philadelphia.

[Dr. Sudduth's paper is published under the heading of "Original Communications," page 257, of this number.—Ed.]

President Carr. Gentlemen, we will now have the pleasure of listening to Professor Carl Heitzmann, of this city.

Dr. Carl Heitzmann. Mr. President and Gentlemen: There was a young man in the far West who did farm work until he had grown to be twenty-four or twenty-five years of age. Then he made up his mind to learn to read and write, and he began to learn the a, b, c's. His name was Bob. He found another young man who could read and write, and engaged him to teach him his a, b, c's. The teacher's name was John, and when Bob, who was a very intelligent fellow, reached the letter k he suddenly jumped up and ran out of the door. John shouted after him, "Bob, where are you going?" Bob turned to his teacher and boastfully said, "Now I am going to teach the a, b, c's, John." The gentlemen who have attempted to talk about the history of the development of the teeth this evening have only reached the letter k of the a, b, c's, and that includes myself, because in my twenty-five years' work on the teeth I have not yet reached the letter z in the alphabet of their histology. Dr. Williams in his paper does me the honor of repeatedly quoting me, and especially alludes to things that I am assumed to say regarding the history of development in my book. But there I say very little, for all that is published in my book about the teeth emanated from Dr. Bödecker and Dr. Abbott. The little I say of the history of their development is that we don't know anything about it. Whether this is worth quoting or not I don't know. I feel thankful to Dr. Williams that he does quote me, but I don't deserve it. The few points that I have looked into in connection with this subject are just those which Dr Williams ignores entirely in his paper. Dr. Williams has said some things of great wisdom indeed. For in-

stance, one of the important points he brought forward was that the bone-formers will not produce dentine, and the dentine-formers will not produce bone. That is just as good as to say that a white man will not produce a black child and a negro will not produce a white child. I ask what is gained by such speculations on vital forces? Of course there will be a few who still believe that there may be an exception to the rule that a black man cannot produce a white child.

Dr. Williams's explanation of teeth being found in the ovarian cyst is that remnants of previous epithelia, which once helped to form teeth, were transported into the ovary, there developing teeth. Then he admits another theory, that perhaps the epiblast which produces the tooth originally might have caused some mischief in the ovary, giving rise to teeth in the ovarian cyst. But, gentlemen, a white man cannot beget a black child. How is it possible that in the ovary not only teeth are present, but there are hairs, bone, cartilage, and even muscles? We know a theory that will explain it,—viz., that in the earliest period of the development of the embryo there was developing another one, inclosed in the ovary, and parts of the inclosed embryo developing in the ovary were left and grew there, just the same as if present in the womb.

Quite recently I was asked to see a tumor which was removed from the abdominal cavity of a living woman by Dr. Mundé, replacing one of the ovaries. I cut into and found it hollow. I examined it under the microscope, and, much to my surprise, I found this to be the chorion, with its villosities, of a six-weeks embryo. This fact gives a positive hint as to the development of teeth in the ovary. But why should we speculate and argue about the presence of teeth in the ovaries of women? If we only knew the history of their development in the mouths of men we were a very happy people indeed; but we do not. In the last twenty-five years I have seen plenty of specimens,—more, perhaps, than any other person present, —but notwithstanding such a large experience I cannot say that I am ready to settle this matter positively.

Dr. Williams says it is mere speculation to maintain that the dentine is kindred to bone-tissue, because in the latter there are globular territories which he thinks are lacking in dentine. I will ask Dr. Williams if he has ever seen the so-called interglobular spaces of Czermak, by no means a pathological condition? They often occur some distance below the enamel traversed by canaliculi. I ask Dr. Williams whether he has ever seen the bay-like excavations of dentine of temporary teeth, invariably present in the process of dissolution, preceding the falling of such teeth? I ask Dr. Williams if he has seen specimens of inflammation of the dentine, where bay-

like or globular excavations occur, traversed first by dentinal canaliculi, and later broken up into medullary corpuscles? Still he asks, Is there any such thing as a globular structure of the dentine? I was prepared for almost any attack, gentlemen, but not for that; because I had supposed there was not the least doubt that the dentine is globular in its structure, the same as bone. That, however, dentine is not bone, and bone is not dentine, is one of those ingenuous assertions of Dr. Williams which can scarcely be discussed.

Let us inquire about the history of the development of the dentine. I will draw here the boundary line of the dentine towards the pulp, and close to the dentine the odontoblasts, which send offshoots into the dentinal canaliculi; two or three dentinal fibers, sometimes only one. Can Dr. Williams explain how, by the calcification of these odontoblasts, the globular basis-substance of dentine will arise? For it seems not only antique, but almost antediluvian, to speak of a secretion as causing the formation of the basis-substance. How can he explain the fact that in the recently-formed dentine there are fields of basis-substance much narrower than the original odontoblasts? I have studied this question over and over again, and have come to the conclusion that the odontoblasts cannot be direct dentine-formers. To explain the formation of the globular character we must take another ground,—namely, that the odontoblasts are not permanent, stable forms at all. They are forms which arise and are visible during the period of rest of the pulp-tissue. As soon as dentine is about to form the odontoblasts break down or split up into medullary corpuscles; and we often see directly the globular shape of groups of such corpuscles. Between the medullary corpuscles the dentinal fibers are formed, although they were originally in connection with the odontoblasts. The odontoblasts are not direct formers of the dentine, but the medullary corpuscles are, just the same as in any other variety of tissue. The odontoblasts are materially the same formations in relation to future dentine as the osteoblasts in forming bone-tissue.

The second point which Dr. Williams alluded to was the formation of the enamel. I purposely left his sketch on the blackboard, because I am sorry for it. The greatest achievement of scientific American dentistry is the knowledge of the minute anatomy of the teeth. Up to the time of the studies of Bödecker and Abbott the histology or minute anatomy of the teeth was about at the level at which the Philadelphia gentlemen seem to be to-day. Their histology is a little yellowish with age,—a little musty. We have learned something from the careful researches of Dr. Bödecker, and it does not make any difference that they were made in my laboratory. Dr. Bödecker was the first to find out that the enamel and the den-

tine are both living tissues. Then Dr. Williams comes with the assertion that about ninety-seven per cent. of lime-salts are present in the enamel, and that the rest is organic material. What is the chemist doing when he goes to measure or weigh his lime-salts? Surely destroying the living matter first, either by fire or by some reagent. To positively state how much organic matter the enamel contains is impossible. That it is very little I admit, but that there is some living matter in the enamel is quite certain. A celebrated worker in dental histology was here three years ago, Prof. Wedl, my old teacher. He visited my laboratory, and we discussed this enamel question. He was then sixty-nine years of age, somewhat older than our friend Dr. Williams. I asked Professor Wedl to please tell me his opinion about the enamel-fibers which Dr. Bödecker has discovered and described. He said in answer: "There is not the least question in my mind that the enamel-prisms are separated from each other by narrow interstices." Said I to him, "Who tells you that? Where have you read that?" Because we had looked over the whole literature of the subject, including his own book, and every author gives that unfortunate picture that Dr. Williams gives, illustrating that the enamel-prisms are in close contact with one another. I am very much afraid that Dr. Williams is looking at the enamel from a stand-point that has been abandoned for at least ten years. An authority, whom Dr. Williams will scarcely doubt, is Dr. Tomes, of London. He was here last year, and was shown enamel in Dr. Bödecker's house. He drew the fibers between the rods of the enamel just as we see them. Take a temporary tooth and grind it, and you can easily see the enamel-fibers. Or take a section of pigmented enamel, and you will see the fibers, because in the pigmented enamel the difference in color is greater than it is in ordinary white enamel; the interstices are wider and the fibers positively plainer.

Now we come to the question of the development of enamel. It is the most difficult question of all. Dr. Williams justly alludes to the presence of ameloblasts, nucleated bodies, and he admits that not infrequently we see in a section long fibers which go to and from the already formed enamel. He gives a beautiful explanation of this fact. He says, if you put your fingers into syrup and draw them out, you will have a thread of syrup from each finger. But that is Philadelphia syrup. I do not like it. Has Dr. Williams forgotten that we harden our specimens first in chromic acid? There is nothing of the consistence of syrup any more. When we make the sections the fibers are really present, not only when drawn out by the razor, but also *in situ* between the ameloblasts.

Now, gentlemen, we come to the point that, according to Dr.

Williams, there is no similarity between the development of the enamel and that of dentine. He asserts that the ameloblasts directly form the enamel-rods. One point, as I said, is very superficially touched upon in my book; and although Dr. Williams does me the honor of repeatedly quoting me in his paper, he gives no explanation of what is to be seen. After the sixth week of embryonal life a prolongation of the stratified epithelium of the oral cavity is formed, a solid peg, and which is admitted to be the future enamel; whereas from the embryonal connective-tissue is formed a button-like projection, the papilla, viz., the future dentine. The epithelial peg is originally solid. Does it remain solid? No; in the third, fourth, or fifth month of the embryo, before any dentine begins to grow, you distinctly see that the epithelial peg becomes hollowed out, and in its interior begins to show a myxomatous tissue, consisting of a beautiful reticulum, long since known. Whence is that myxomatous tissue? Nobody has maintained that myxomatous tissue is epithelial tissue, but it is admitted to be a variety of connective-tissue. Nobody will maintain that migrating corpuscles have crept through the epithelium in order to produce myxomatous tissue; therefore we must argue that the latter has developed from the epithelia. But now comes a learned man and says that epithelium will never produce connective-tissue, for these are tissues of their own, independent from each other. Such a man overlooks one thing, however, viz., that the whole nervous system of the embryo is developed from the epiblast, which is distinctly epithelial. The original brain and spinal cord is a prolongation of the epiblast. From that arises the nerve-tissue, which is freely mixed with connective-tissue and freely vascularized. I deny that there is no transition from epithelial to connective-tissue and vice versa, although I concede that nobody else would admit such a liberal view, contrary to all that the books teach.

Do not forget the instructive story of the Austrian peasant, who had a vineyard and raised sour wine year after year. One day an expert in wine-making came there and said to him, "My dear fellow, why don't you take into consideration the new methods of cultivation? Why don't you import some seedlings and get a better wine? Your soil is splendid, and you could have a brilliant wine if you would just adopt the improved methods of culture." And the conservative old peasant replied, "My father and my grandfather did as I do, and raised wine without these new methods. Why should I change what they found good enough?" And of course the man still raises sour wine. A great many histologists are in the same situation. They have learned the old doctrines and stick to them. Nature does not narrow herself to any one idea of a histologist. From

this point of view, gentlemen, all the previous assertions as to the formation of the enamel-prisms directly from the ameloblasts must fall to the ground. Before the ameloblasts are formed there are present medullary corpuscles; and before enamel-rods do form the ameloblasts are again broken up into medullary corpuscles. Then the same rule holds good in respect to the history of development of the enamel that applies to the history of development of the dentine. In one case it goes toward the center, centripetally, and in the other toward the periphery, centrifugally. The ameloblasts are merely provisional forms, similar in aspect to epithelia, the same as are the odontoblasts and osteoblasts.

That already formed tissues of a certain type do change their character by falling back into the medullary or embryonal condition, afterward giving rise to an entirely new tissue, is a well established fact in histology. Look into the history of development of bone. In the embryo there is no bone, but cartilage only; for the first tissue that forms from the medullary tissue is cartilage. This, before being transformed into bone, falls back into its medullary condition, and the medullary tissue at last forms bone. If you break a bone purposely, in order to find out how the fracture heals, the same thing will happen. What we call provisional callus is nothing but cartilage. The medullary or inflammatory corpuscles in this instance first form cartilage,—not directly bone,—but the cartilage breaks down into medullary tissue afterwards, and at last arises bone-tissue, the permanent callus.

Now, gentlemen, comes the question of caries. Dr. Williams takes three victims, Dr. Abbott, Dr. Bödecker, and myself, and tries to twist our heads off and put them in his pocket. Dr. Bödecker is to follow me, but I am very much alive yet to defend myself and kick against Dr. Williams. These three men, he says, have made up a theory regarding the cause of caries, and they give certain figures, just because it suits their theory of the development, formation, and anatomy of dentine and enamel. He speaks with great emphasis of what a horrid thing such a procedure is. One thing, however, Dr. Williams has overlooked,—that Dr. Abbott has not insisted upon the fact that caries is primarily an inflammatory action. He says in a foot-note first that a dead tooth decays,—is destroyed in a chemical way,—meaning by an acid, of course. Dr. Abbott says that in living teeth the first impulse to decay is an acid that works upon the enamel, and from that impulse comes the process of disintegration. He speaks several times of micro-organisms in his paper. He simply claims that in living dentine and enamel there is a reaction upon the irritation, and that you can see, before the dentine and enamel decay, a zone containing medullary corpuscles. He claims that there

is a reaction upon the injury done by decay. Of course, to say that caries is primarily an inflammatory process would be a mistaken ground; and nobody is willing to claim that there was inflammation in an entirely dead tooth. Now, these gentlemen from Philadelphia almost kneel down before the great god Miller and worship him; forgetting that all that was said long before Miller by Leber and Rottenstein. There is not the least question to my mind that the enlargement of the tubules is not caused by the growth of leptothrix and micrococci alone; but there is a decalcification before decay, and decaying material is just crowded with such micro-organisms; and upon the irritation of this decaying material sets in an inflammatory reaction in a secondary way. You can see in Miller's specimens that the growth of micro-organisms does not go so far as the decalcification goes. Therefore, there is first decalcification; then a growth of leptothrix. Nevertheless, they say that all decay depends upon the leptothrix. Behind all this decalcified zone you invariably see, in specimens taken from live teeth of man, and preserved in a chromic-acid solution, inflammatory changes. Such specimens of caries are to be seen in my laboratory in any number. Dr. Sudduth says God made man perfect, and man makes himself imperfect. I doubt that very much, for nobody is born perfect. Neither is life an enjoyment, but rather misery and hard work. As Dr. Sudduth says, a scientist must show what he affirms. It is not enough that he makes drawings only; he must prove them by specimens. I have such specimens; and my laboratory is, year after year, crowded by students, including many dentists, who come to me to see these things, and I believe that all of them leave satisfied. Does Dr. Sudduth doubt that what we represent is correctly done from nature? Most of the drawings I made myself, because I am an old draughtsman, and I think everybody has admitted that I can draw. These illustrations are made with the utmost care as to details. We do not take it easy in our laboratory. It is very hard work indeed. Will Dr. Sudduth do me the favor to come and look at these details? He says he cannot see them; and that I believe, word by word. He cannot see, I am satisfied.

Dr. Williams. Mr. President and Gentlemen: Dr. Heitzmann's remarks remind me of the reply which a talented young Congressman, a fellow-townsman of yours, made in answer to certain critical remarks of Mr. Blaine,—that he had yet to learn that it was a crime to be a young man. I have the highest respect for the wisdom and experience which comes with years, but I submit that the time is past when the value of a man's scientific opinions is to be based upon the number of summers and winters which have passed over his head. I think we may all appreciate the extremities to which

the professed champion of scientific truth is driven, when he finds it necessary to resort to the recital of funny stories in order to distract the attention of his audience from the weakness of his position. In a different sense from that intended by Dr. Heitzmann I accept the rebuke; it is well for a young man not to know too much. The obstinate pride of opinion which sometimes leads men of years to turn away from the new truth which is constantly coming into the world has doubtless often grown out of the puffed-up, conceited wisdom of earlier years. Therefore, if a young man does not place too high an estimate upon his present acquirements, he is likely to learn something as he grows older. Besides, I believe with Josh Billings that "it is better not to know so much than to know so many things that ain't so."

There is another and a better reason why I will not occupy your time in replying to the very few points of significance in Dr. Heitzmann's remarks. We have with us to-night a gentleman who is older than I am, who is older than Dr. Heitzmann, and who has spent his entire life in the study of the development and histology of the teeth. If this gentleman, for whose scientific attainments I have the highest respect, shall confirm the position which I have taken, it will at least be a complete answer to the silly story of the country youth who desired to pose as a teacher before having himself learned the alphabet. The attitude which Dr. Heitzmann has assumed in this discussion forces me to mention a little incident which occurred several months ago, and which I should not feel like mentioning but for his misrepresentations of the position which I have taken. He correctly says that I spent some time in his laboratory as a student, but his statement that I was in agreement with all of his vague theorizing is quite unwarranted. I went there, not to contradict his statements, but in the hope of gaining some new light on the subjects in which I was most deeply interested at that time. But Dr. Heitzmann has evidently forgotten that several months after I left his laboratory I returned and exhibited some specimens to him, in the presence of Drs. Atkinson and Bödecker, in which the dentinal fibrillæ were shown to be offshoots of the odontoblasts. At that time Dr. Heitzmann frankly admitted that the point was clearly demonstrated, and that he had been mistaken in his teaching that these fibers originated in the pulp reticulum and passed between the odontoblasts.

Dr. Heitzmann. Will Dr. Williams remember that I drew offshoots of the odontoblasts on the blackboard,—not only one, but two or three?

Dr. Williams. Do you mean before I exhibited the specimens to which I have just referred?

Dr. Heitzmann. · Yes.

Dr. Williams. I remember that some time before this you attempted to reconcile the observations of all our recognized teachers of this subject with your own views. Are there any drawings in your book showing the dentinal fibrillæ as offshoots of the odontoblasts?

Dr. Heitzmann. Several are drawn there between the rows.

Dr. Williams. No such appearance is shown in any of the engravings in your book, and I have never seen any of your drawings remotely resembling the sketch which I have made on the blackboard.

President Carr. Gentlemen, the discussion of this subject will now be continued by Dr. Bödecker of this city.

Dr. C. F. W. Bödecker. Mr. President and Gentlemen: It is well known, ever since the publication of Franz Boll, of Bonn, that whenever a fiber develops from a protoplasmic body it is always from its periphery, and never in any instance from its center. Fibers may appear as though coming from the end of a protoplasmic body, but they are peripheral formations sometimes joining at a point in one of the ends of these corpuscles, either the front or the back. This may have led to the belief that the fibers extending from protoplasmic bodies called odontoblasts are developed from their center. I have seen many specimens of odontoblasts and other tissues, but I have never in a single instance been able to observe that a fiber from the point of the odontoblast has been traced through the center, nor do I believe Dr. Williams has. Dr. Williams and Dr. Sudduth both claim that there are no enamel-fibers present in any preparation of human enamel. If these gentlemen will take the trouble to split a freshly-extracted tooth and throw it into a solution of osmic acid which will stain the living protoplasm and nerve fibers, they will find that it has stained the enamel-fibers as well as the dentine-fibers in their proper situation. The history of the development also shows this. The fibers are quite plainly visible in every embryonic specimen of enamel. In fact, it was such specimens that led me to the study of enamel-fibers; although I have to admit that the enamel-fibers in adult teeth, when stained with other reagents than osmic acid, do not appear very distinctly, for when studying enamel with Dr. Heitzmann, on calling his attention to the fibers in a ground section of enamel, very slightly stained with an ammoniacal solution of carmine, he laughed and pronounced it to be dirt from the process of grinding; but after studying another specimen, stained with chloride of gold, he fully admitted the presence of enamel-fibers. Dr. L. Waldstein—a gentleman who has been an histologist and was the assistant of Professor Arnold, of Heidelberg,

for years—saw some preparations which I had arranged for the microscope, and I asked him to tell me whether he was able to observe any fibers within the enamel. I informed him that the specimens were prepared and stained in the following manner: The teeth, immediately after extraction, were split and immersed in a one per cent. solution of hyperosmic acid for twenty-four hours, and then put in absolute alcohol for two or three days, ground thin upon a corundum-wheel, and mounted in the usual manner. After a careful examination, Dr. Waldstein pronounced the dark fibers lying between the enamel-rods to be protoplasmic formations. Therefore, unless there is something mysterious about the osmic acid, or the lenses I employed (which were made by Zeis) are unreliable, I must hold to the assertion that there are enamel-fibers between the calcified rods of enamel in the human subject.

I have examined many specimens of ground teeth the peripheries of which were slightly attacked by caries. In one specimen I noticed places where a little of the enamel was rubbed away,—hardly perceptible to the naked eye. In the fissures of the tooth there was very slight decay. I observed at the boundary between the dentine and enamel a reaction in the enamel-fibers which made them appear much swollen at a point corresponding to the enamel that had been rubbed away at the periphery; also, at a point corresponding to the fissure which was slightly decayed. Some of the fibers thus affected could be followed for quite a distance, and they appeared the thickest or most swollen towards the boundary of the enamel and dentine. Gentlemen, can you imagine that bacteria would have crawled in at the periphery of the enamel along the fiber without leaving a trace or track, and only produce a reaction near the dentine; or, to use an expression of Dr. Abbott's, without "using their acid bottle" in the beginning? Evidently they did not use it at the beginning, because I observed no enlargement of the interstices or reaction of the enamel-fibers at the periphery, but only between the boundary of the enamel and dentine, and corresponding in width to the place of injury. Of course, it is quite evident from this that there must be living matter in the enamel; for, if there were no living fibers in the enamel, how could such a reaction occur? Dr. Sudduth acknowledges that the enamel is absolutely closed at the periphery, and that nothing can get through. If there is no living matter there, what produces that reaction? I have never observed it in specimens with perfectly sound enamel around the periphery of a tooth. I have shown these specimens to Dr. Heitzmann and Dr. Abbott, and anyone who chooses to come to my house or Dr. Heitzmann's laboratory can see them.

With regard to the elucidation of the question of necrosis, spoken

of by Dr. Sudduth, I have to mention that one of my first attempts to study special subjects in Dr. Heitzmann's laboratory was the observation of necrosis. Both Dr. Heitzmann and myself were much surprised at the slight difference, under the microscope, of normal and necrosed specimens of bone. It is all very well for gentlemen to say that necrosis of bone is an entirely different process from caries of teeth, and in a certain measure that is so; but I do not believe that caries can be so very widely distinguished from necrosis. I do not, therefore, object to the term caries in comparison with caries of bone, although it must be acknowledged that bacteria must necessarily exert an immense influence upon caries of the teeth, because they are present wherever putrefaction is going on. May the patient be ever so healthy, they are there; and the conditions are nowhere in the body so favorable, probably, to the production of caries as in the mouth. But, at the same time, I cannot believe that caries is the immediate and only result of these organisms, and that the reaction of the living protoplasm which is visible during caries should have no influence in this process. In specimens of caries of dentine which I showed to Dr. Waldstein,—who is a perfectly impartial observer, and who has had much experience in the study of bacteria; has written several essays on that subject, and is frequently quoted in medical literature,—although he did not at the time know anything about the dental tissues, he at once acknowledged that the reaction in the dentine was inflammatory in its character. I asked him, "Are there any bacteria present?" He replied, "There are plenty, but the reaction of the protoplasm is so evident that I am perfectly convinced it cannot be from bacteria alone."

Evening Session.

Dr. J. L. Williams. Mr. President and Gentlemen: I crave your kind indulgence just two or three minutes. There seem to me to be only two points in Dr. Heitzmann's paper that I care to make any reply to,—two points that seem to me so manifestly absurd that I must say just a word or two. I have cut a good many hundred specimens of pulps of embryo and adult teeth, and I never saw any different appearance from that presented there [illustrating on the blackboard] of the odontoblast layer of cells before the commencement of the process of calcification. There are present here at least four gentlemen who have made almost a life-study of this subject, and I think they will bear me out in the statement that in all the specimens they have cut they have never seen any other appearance than substantially that,—the cells having that form of a prolongation of the dentinal fibrillæ coming out from there in this manner, sometimes one, sometimes more, to the extent of a dozen, more or less.

This is, as nearly as my memory serves, a representation of it on the board. May be Dr Heitzmann has, but in all the specimens I have cut I have never seen an appearance like that which he has shown, not one; and I think the gentlemen who have spoken before me will bear me out, and say that they have never seen, after the commencement of calcification, an appearance like that. Now, in regard to the fibers in enamel. (You see I have a teachable disposition. I may remark that this drawing is after the improved style of Dr. Heitzmann.) Now, suppose the section of enamel represented had been cut directly through at the point which I indicate. This represents a transverse section of the enamel, and these are the enamel-fibers cut transversely. This, Dr. Heitzmann says, is the position which the enamel-fibers occupy. Suppose the section should have been cut through there. The result would be that we would not have touched a single enamel-fiber. But the appearance is so nearly the same in the enamel-fibers that I am not able to detect the difference in appearance of that which he regards as enamel-fibers. You see it is almost impossible, on the theory of enamel-formation given in my paper, to cut a section and not get the appearance here shown. This represents a longitudinal section; this represents the intercellular formation,—interprismatic layer.

Dr. Atkinson. Don't say cellular.

Dr. Williams. Suppose we cut through here in this direction; the result is that we have cut two fibers; if we have been fortunate enough to cut straight through we will get the appearance of two fibers at that point; but nowhere else in this section will we get any appearance of fibers. On the contrary, the appearance is as represented here. But in all the longitudinal sections I have ever cut the appearance is substantially the same, and there is no possibility of explaining that appearance except that what has been mistaken for fibers is simply the interprismatic cement-substance which unites the cells in that manner.

Dr. Heitzmann. Dr. Williams certainly has made a grand improvement in that drawing. I claim the merit of that. That looks more natural than the specimen indeed. I do not know how Dr. Williams, who claims to have studied these things for several years, can change his mind in five minutes in that matter. I have not much to say about the correctness of this view, except I would add with red chalk a few corrections in the appearance of the transverse section. If Dr. Williams says this would be a longitudinal section, to use his own words, it would be absurd. If this is a transverse section, I presume that would be a longitudinal section; but the transverse section that he drew here with red chalk will correspond to the fibers running here.

Dr. Williams. Suppose it is cut in this point, here?

Dr. Heitzmann. You cannot cut such a section at all.

Dr. Atkinson. Extending between those yellow points through there.

Dr. Heitzmann. Certainly. That is what we claim.

Dr. Williams. Suppose this to represent a transverse section; if we cut in that direction, how can we get a single enamel-fiber?

Dr. Atkinson. That which has been called a fiber is the sheath that surrounds the fibril. Dr. Williams clearly showed in his first diagram that it was the enamel or organic matrix in which the inorganic substance was deposited, and that you could not cut through there without coming in contact with and bisecting one of those.

Dr. Williams. That is the point.

Dr. Heitzmann. Dr. Williams maintains that if he cuts a longitudinal section it is impossible to see the enamel-fibers.

Dr. Williams. I say if it is made through this transverse section you cannot strike the enamel-fibers at all.

Dr. Atkinson. If the enamel-fiber does not involve the entire periphery of the prism.

Dr. Heitzmann. That is the point. There are fibers in the longitudinal section, but it is impossible to see the fibers everywhere. In no drawing that Dr. Bödecker ever made is such a relation present.

Dr. Abbott. Mr. President, in further answer to Dr. Williams, I will give as briefly as possible what I understand to be the manner in which the enamel and dentine are formed, and their destruction by caries. Then I will try and answer some of the points made by Dr. Sudduth. Instead of a *secretion* from the ameloblasts, as suggested by Dr. Williams, enamel is formed by the calcification of successive layers or rows of these corpuscles, and the reticulum of living matter contained in them is preserved and exists in the formed enamel. Dentine, likewise, is formed by the calcification of successive rows of odontoblasts, and the reticulum of living matter which is plainly visible in them remains as the living matter (Tomes's fibers) in the formed dentine. I will here state that I cannot conceive of the slightest injury to any living tissue, no matter where located or from whatever source the injury may come, without its producing an irritation of such tissue. The first lesion in the carious process of human teeth is a solution of the lime-salts of the surface of the enamel by some acid, generally produced by the fermentation of particles of food, saliva, etc. As soon as the living matter is reached it becomes irritated, which irritation if allowed to proceed soon assumes the condition of inflammation of that tissue, and advances along the enamel fibers *in advance* of the solution of

the lime-salts by acids. When it reaches the dentine this inflammatory condition advances more rapidly, and is much more intense, in consequence of the greater amount of living matter to become affected. The lime-salts, after having been *dislodged by the swelling of the living matter*, are dissolved by acids and washed away. As they are carried away the reticulum of the former odontoblasts again presents itself and is eventually destroyed by putrefaction. During the latter process this portion of the decaying tooth becomes filled with "organisms of decomposition."

In the drawing which has been so timely exhibited by Dr. Sudduth of a specimen sent him by Dr. Miller a zone or territory of inflamed dentine is plainly shown far beyond that occupied by organisms. This is the territory claimed by Leber and Rottenstein, and since by Dr. Miller and others, to be in a condition of decalcification by the solvent action of some acid. Now, this view, so far as I have been able to learn, is a mere supposition, its substantiation being based upon the experiments in "pure culture" conducted by Dr. Miller, and of course out of the mouth, which *proves* nothing as to the actual conditions in the mouth. The experiments of Prof. Mayr (*New England Journal of Dentistry*, Vol. ii., No. 1), which most emphatically disprove such a position, seem to be altogether lost sight of by these gentlemen. *It is a mistake on their part when they state that caries of dentine differs from caries of bone in that the process advances by the solution of the lime-salts and the subsequent destruction of the organic portion by organisms.* It is also claimed by these gentlemen that the usual features of inflammation are not present in a decaying tooth. I would ask, what portion of the organism is subject to irritation? Is it not the living matter? The heat, redness, swelling, and pain are effects, not causes, of inflammation.

It has been stated that we do not show our specimens. In answer I would state that they have been shown to every one who would take the trouble to look at them on every occasion that has presented itself; that Dr. Heitzmann has used them on all occasions in his classes, so that probably not less than one hundred gentlemen have become more or less familiar with their appearance under powers ranging from two hundred to fifteen hundred diameters. When Dr. Miller was here a year ago last summer he promised to send me some of his specimens for examination, but while he has sent them to others at different times none have come either to Dr. Heitzmann, Dr. Bödecker, or myself. I asked Dr. Williams to kindly afford me an opportunity to study the specimens from which these drawings were made; but no! Dr. Sudduth needed them at least a month to have drawings made which would take at most but a few hours to do. What does all this mean? We are accused of "forming a

theory" in reference to the formation and caries of teeth to suit our peculiar ideas previously conceived. In view of these facts, I would like to ask if it would not be more in the interests of fair play, to say the least, if these gentlemen would take this charge to themselves. As far as the "cell theory" vs. the "bioplasson theory" is concerned, I hardly need refer to it, as my views upon the structure of tissues are well known to the reading portion at least of the dental profession.

(To be continued.)

At the annual meeting of the society, held Tuesday evening, April 6, 1886, the following were re-elected to the respective offices:

William Carr, president; J. F. P. Hodson, vice-president; B. C. Nash, secretary; Charles W. Miller, treasurer; J. Bond Littig, librarian. For delegates to the Dental Society of the State of New York, A. R. Starr and F. Austin Roy, each for four years; M. C. Gottschaldt, for three years, to fill a vacancy.

B. C. Nash, D.D.S., *Secretary.*

VERMONT STATE DENTAL SOCIETY.

The Vermont State Dental Society held its tenth annual meeting at Bellows Falls, March 17, 18, and 19, 1886, Dr. G. H. Swift, of Manchester, presiding.

The following were elected officers for the ensuing year: J. P. Parker, president; E. E. McGovern, first vice-president; W. H. Spencer, second vice-president; Thos. Mound, secretary; James Lewis, treasurer; W. S. Curtis, E. S. Tracy, and C. G. Campbell, executive committee.

The next annual meeting will be held at Burlington, the third Wednesday in March, 1887.

Thos. Mound, *Secretary*, Rutland, Vt.

CHICAGO DENTAL SOCIETY.

The annual meeting of the Chicago Dental Society was held April 6, 1886, when the following officers were elected for the ensuing year:

Frank H. Gardiner, president; P. J. Kester, first vice-president; W. B. Ames, second vice-president; J. G. Reid, recording secretary; A. E. Matteson, corresponding secretary; E. D. Swain, treasurer; A. W. Harlan, librarian; L. L. Davis, J. W. Wassall, and B. L. Rhein, board of censors; Geo. H. Cushing, J. A. Swasey, and E. Noyes, board of directors.

A. E. Matteson, *Corresponding Secretary*,
3700 Cottage Grove avenue, Chicago, Ill.

FIFTH DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The Fifth District Dental Society of the State of New York held its eighteenth annual meeting at Rome, N. Y., on Tuesday and Wednesday, April 13 and 14, 1886.

The following officers were elected for the ensuing year: G. L. Curtis, president; C. H. Bennett, vice-president; C. J. Peters, recording secretary; B. T. Mason, corresponding secretary; A. R. Cooke, treasurer; A. Retter, librarian.

C. J. Peters, *Secretary*, Syracuse, N. Y.

AMERICAN DENTAL ASSOCIATION.

The votes of nearly all the members have been received. A majority of the votes cast are in favor of Chicago over all other places, and a very large majority pledge their attendance if the meeting shall be held in Chicago. But in deference to the minority, and for the sake of harmonizing all differences, as chairman of the Executive Committee and Committee of Arrangements, I hereby, with the consent of my colleagues, announce the next place of meeting to be at Niagara Falls, August 3, 1886.

Information concerning hotel and railroad rates will be given later.

J. N. Crouse, *Chairman Executive Committee.*

2101 Michigan Avenue, Chicago, April 16, 1886.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

The eighteenth annual meeting of the Dental Society of the State of New York will be held at Albany, N. Y., Wednesday and Thursday, May 12 and 13, 1886, the first session beginning at 10 o'clock A. M.

The Board of Censors will meet at the same place, Tuesday, May 11, for the examination of candidates for the diploma of the society and the degree of M. D. S. Full information in regard to the subjects and conditions of the examination may be obtained of the secretary of the board, Dr. Frank French, Rochester.

J. Edw. Line, *Recording Secretary*, Rochester, N. Y.

SUSQUEHANNA DENTAL ASSOCIATION.

The thirty-eighth annual meeting of the Susquehanna Dental Association will be held in Lock Haven, Pa., on Wednesday and Thursday, May 12 and 13, 1886.

The courtesies of the floor will be extended to all dentists, whether members of the association or not, who may wish to take part in the exercises.

E. J. Baird, *Secretary*, Lock Haven, Pa.

CONNECTICUT VALLEY DENTAL SOCIETY.

The semi-annual meeting of the Connecticut Valley Dental Society will be held at Hartford, Conn., June 10 and 11, 1886.

A cordial invitation is extended to all members of the profession to attend.

George A. Maxfield, D.D.S., *Secretary*, Holyoke, Mass.

MAD RIVER VALLEY DENTAL SOCIETY.

The Mad River Valley Dental Society will hold its annual meeting in the parlors of the Phillips House, Dayton, Ohio, on Tuesday, May 18, 1886. Members of the dental and medical professions are invited to attend.

L. C. Adams, *Secretary*, Dayton, O.

NORTH CAROLINA DENTAL ASSOCIATION.

The twelfth annual meeting of the North Carolina State Dental Association will be held in the City of Raleigh, commencing Tuesday, June 1, 1886, and continuing three days.

All interested, and especially dentists from other States, are cordially invited to attend.

The State Board of Dental Examiners meets June 1, at Raleigh.

Thomas M. Hunter, *Secretary*, Fayetteville, N. C.

UNIVERSITY OF IOWA—DENTAL DEPARTMENT.

The fourth annual commencement of the Dental Department of the State University of Iowa was held at the Opera House, Iowa City, Iowa, on Monday evening, March 1, 1886.

The annual address was delivered by A. B. Robbins, D. D., and the valedictory by William J. Brady, D. D. S.

The number of matriculates for the session was forty-nine.

The degree of D.D.S. was conferred on the following graduates by J. L. Pickard, LL.D., president of the faculty:

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Wm. J. Brady	Iowa.	Geo. E. King	Iowa.
J. C. Allender.	Iowa.	L. D. Hodge	Iowa.
H. M. Baird	Iowa.	B. B. Hyler	Iowa.
Geo. Babcock	Iowa.	C. M. Lathrop	Iowa.
E. M. Crawford	Iowa.	H. A. Leininger	Illinois.
M. J. Doolittle	Illinois.	T. G. Vernon	Iowa.
O. A. Dunham	Iowa.	B. H. Woodward	Iowa.
W.W. Donaldson	Iowa.	E. G. Woodrow	Iowa.
J. E. Fleener	Iowa.	B. H. Mommer	Indiana.

CHICAGO COLLEGE OF DENTAL SURGERY.

The fourth annual commencement exercises of the Chicago College of Dental Surgery were held at the First Methodist Church, Chicago, on Wednesday afternoon, March 31, 1886.

The class valedictory was delivered by Robert E. Moon, D. D. S., and the address to the graduates by W. L. Copeland, M. D., C. M., M. R. C. S., professor of anatomy.

The number of matriculates for the session was eighty-one.

The degree of D. D. S. was conferred on the following graduates by Dr. James A. Swasey, president of the board of directors:

NAME.	RESIDENCE.
Harry Tenn Carson	Illinois.
Emory Melvil Cheadle, M.D.	Oregon.
Louis Chismann	Illinois.
Joseph Grant Emery	Illinois.
Gilbert Walter Entsminger	Illinois.
Frank Eshbaugh	Illinois.
Ernst August Huxmann	Illinois.
Henry Frederick Marcoux	Illinois.
Joseph Perry Mertes	Wisconsin.
Theodore Felix Molt	Illinois.
Robert Ellsworth Moon	Indiana.
Otto Henry Staehle	Illinois.
James Stewart	Illinois.
Thomas Benton Wheeler	Illinois.
Ellsworth Otis Whipple	New York.
Alfred Rogers Wilcox	Illinois.

UNIVERSITY OF TENNESSEE—DENTAL DEPARTMENT.

The eighth annual commencement of the Dental Department of the University of Tennessee was held, in connection with that of the Medical Department, in the Masonic Theater, Nashville, Tenn., on Friday evening, February 26, 1886.

The valedictory address was delivered by G. W. Myers, D. D. S.

The degree of D. D. S. was conferred on the following graduates by Hon. John L. Moses, president of the board of trustees:

NAME.	RESIDENCE.
J. S. Cottrell	Tennessee.
E. F. Cunningham	Tennessee.
C. L. De Shields	S. Carolina.
C. N. Harrell	Georgia.
W. S. Jordan	Georgia.
W. D. King	Alabama.
G. W. Myers	Kentucky.
D. G. Nisbet	Mississippi.
A. W Palmer	Tennessee.
M. L. Rudolph	Tennessee.
J. C. Spivey	Mississippi.
E. G. Stuart	Texas.
Duff Post	Florida (honorary).

EDITORIAL.

PROPRIETARY ANESTHETICS.

Our attention has again been called to this subject by a correspondent, who inclosed a circular announcing "a new discovery for producing natural sleep at will; safe and efficient for extracting teeth without pain or danger; indorsed by the leading medical journals in Europe and America."

The proprietor of this wonderful agent claims that it was dis-

covered after years of labor and research; that since 1864 he has been constantly on the alert for some agent that would be more efficient, safe, and economical than nitrous oxide. He appends statistics showing its relative economy, and testimonials as to its safety and efficiency. He claims that he was led to the investigations which resulted in the discovery of this *new* anesthetic from the conviction that "progressive science should devise means for producing natural sleep at will," and he therefore determined to investigate and discover if possible some agent that would not be open to the objections which appertain to chloroform, ether, and nitrous oxide gas, all of which he considers unsafe because they produce congestion of the brain, and death is likely to result from such abnormal condition; that the *new* anesthetic produces natural sleep without congestion, and is therefore absolutely free from danger, and that "heart disease, pregnancy, lactation, menstruation, kidney troubles, and old age are no drawbacks in its administration." The discoverer of this new anesthetic has given it the name of "Soporative," the word being derived from the Latin *soporo*, meaning natural sleep, as we are informed in the circular.

Realizing at once the value which an agent of this character would have in the practice of medicine and dentistry, we procured a bottle direct from the proprietor, at a cost of five dollars, at once submitted it for analysis, and have received the following report thereon:

PHILADELPHIA, March 29, 1886.

J. W. WHITE, M.D.:

DEAR SIR: The sample of "Soporative" received from you on the 24th inst. has been examined. It is *Bromide of Ethyl*, flavored with rose, and containing distinct traces of alcohol, as follows:

Bromide of ethyl	99.13 per cent.
Alcohol and oil of rose	.87 "
	100.00

Yours truly, HENRY TRIMBLE,
Professor of Analytical Chemistry in the Philadelphia College of Pharmacy.

Hydrobromic ether, or bromide of ethyl, was discovered by Serullas, in 1827. It attracted no special attention until 1849, when Dr. Thomas Nunnelly, of Leeds, England, reported some experiments made with it on animals, and again in 1865 reported his experiences with it as an anesthetic. In 1876 Rabuteau, of France, reported some experiments made with it on the lower animals. In 1877 Dr. Laurence Turnbull, of Philadelphia, began experimenting with it upon himself and others, and in 1878 presented the subject before the Pennsylvania State Medical Society. Comparatively little use, however, has been made of the agent by the profession in general for the production of anesthesia, and the following state-

ments regarding it are quoted from the last editions of the volumes named:

The "United States Dispensatory," edition of 1883, has the following remarks upon this agent:

> Bromide of ethyl has been used as an anesthetic, and at one time bade fair to become very popular. The occurrence of two deaths during its use, however, early arrested its successful career. It is a very prompt anesthetic, in most cases acting even more quickly than does chloroform, but less agreeably to the patient. Recovery is very prompt. Its action upon the heart is the same as that of chloroform. * * * It appears to be even more dangerous than chloroform, and will probably never be used to any extent in practical medicine.

The "National Dispensatory" (Stillé and Maisch), edition of 1884, quotes the favorable opinions which were expressed on its first introduction, by several surgeons of note, and adds:

> Deplorable experience has shown how erroneous were all such judgments. Several cases of death occurred under the administration of this agent, so much lauded for its superior safety, and many other cases in which death was certainly imminent. In the fatal cases the result was usually due to syncope, but in one of them did not take place for several days, and then by exhaustion from vomiting. In the cases that did not terminate fatally the phenomena were usually those of cardiac syncope or of obstruction. * * * It appears probable that bromide of ethyl may be dangerous in two ways: first, as a compound, and then by its decomposition in the body. In the former of these modes of action it resembles chloroform, and destroys life by arresting the heart. The possibility of the latter operation has been suggested by Dr. Squibb, who pointed out that the danger from anesthetics is in proportion to the noxiousness of their radicals. Those which are the most readily tolerated are so in proportion to the simplicity and innocuousness of the elements of which they are composed. Bromine is an irritant poison, and bromide of ethyl is very easily decomposed, and its seventy-three per cent. of bromine, an active irritant, is disseminated through the system. According to Squibb, chloroform, although it contains eighty-nine per cent. of chlorine, does not produce as toxic effects as ethyl bromide, simply because two atoms of chlorine are not as poisonous as one atom of bromine. The danger from either anesthetic is by no means past when consciousness returns; the chlorine in the one case and the bromine in the other remains behind, and may still induce grave and even fatal effects. * * *
>
> When first introduced, this anesthetic was cordially welcomed by many surgeons as being more agreeable and prompt than ether, and less dangerous than chloroform. * * * The disasters that followed soon after this and similar declarations seem to have discouraged its advocates and led to its disuse in general surgery.

It is only just, however, to state that Dr. Turnbull, in a paper recently published, while asserting his conviction that "*no anesthetic can be used with absolute safety*," claims that bromide of ethyl is a prompt and efficient agent for use in all operations in minor surgery.

Our controversy, therefore, is not with those who, basing their conclusions upon careful study and investigation, elect to employ

the hydrobromic ether in their practice. But, in view of the conceded fact that any anesthetic is liable to produce a fatal result,—no one being absolutely free from danger to life,—we insist that such interference with vital function should not be undertaken by anyone with an agent the composition of which is unknown to him, nor without a perfect familiarity with its methods of action, the conditions contraindicating its use, the necessary preparatory precautions in its administration, the signs of danger, and the proper procedures in threatened trouble.

AMERICAN DENTAL ASSOCIATION.

It will be seen by an official announcement on another page that the discussion as to the place of the next meeting has resulted in the selection of Niagara.

AN EXTRA HALF FORM.

The accumulation of valuable matter has compelled the addition of eight pages to the current number, and yet we are obliged to ask indulgence for unavoidable delay in the publication of contributions already in type.

OBITUARY.

DR. E. F. SEMPLE.

Died, suddenly, at Dayton, O., February 27, 1886, Dr. E. F. Semple, in the forty-first year of his age.

Dr. Semple's sudden death was caused by heart disease. He was a member of the Mad River Valley Dental Association, and has been in active practice in Dayton since the war. He was well liked by his professional brethren and the community in general. He leaves a wife and two children well provided for.

E. A. BECHT, D.D.S.

Died, at the Hague, Netherlands, February 7, 1886, of pneumonia, Dr. E. A. Becht, in the thirty-fourth year of his age.

Dr. Becht was born in the Hague, July, 1852. He studied dentistry at Boston and Baltimore, graduating at the Baltimore College of Dental Surgery, class of 1873; practiced dentistry in the Hague in partnership with his brother, Dr. C. L. G. Becht. He was an active and honored member of "het Nederlandsch Tandheelkundig Genootschap," of which he was one of the founders. He leaves a widow and three children.

IRBY HARDY, D.D.S.

Died, at the residence of his father, Dr. George E. Hardy, near Blacks and Whites, Va., on Monday, February 1, 1886, Dr. Irby Hardy, in the twenty-ninth year of his age.

Dr. Hardy's death resulted from a lingering disease of the stomach. He was a graduate of the Baltimore College of Dental Surgery, class of 1882, and began the practice of his profession at Blacks and Whites, Va. Being of an urbane disposition, he made friends quite rapidly among his personal and professional associates. He married in October last, and a future of social and professional usefulness seemed opening before him. Dr. Hardy was a well qualified dentist.

HINTS AND QUERIES.

Soporative.—Can any reader of the Dental Cosmos give reliable information as to the constituents, medical properties, and uses of "Soporative," an agent for which extraordinary claims are made as an anesthetic, and which is especially recommended for the painless extraction of teeth? I inclose the circular.—E. D. [See editorial in this number.—Ed. Dental Cosmos.]

To the Editor of the Dental Cosmos:

If R. W. Morris will only make a practice of sticking common brass pins in his impressions before pouring, wherever there are isolated or prominent teeth, he will have no need of the elaborate process of repair mentioned in his communication in the February Dental Cosmos. By using brass pins and not bits of iron or steel wire, the little points sticking through the ends of the teeth in the plaster cast can be ground off on the lathe, as cutting with the pliers often cracks the teeth. This practice is as common in this country as that of using water to mix plaster of Paris, and in the case of undercut or very irregular teeth they can be broken off to get a good zinc cast, and replaced to fit bands, etc., as the pin left in the model is a sure support for the tooth, and a little hard wax holds it from dropping off.—Charles J. Rathbun, *London.*

Seamless Collars.—Permit me to call attention to some new uses for the seamless collars. They may be employed in the construction of regulating fixtures; for instance, to rotate a central incisor, take a fine wire and wrap it around the tooth close to but not under the gum, and cut the wire so that its ends exactly meet to measure the circumference of the tooth. Straighten the wire without stretching it; find its equal in length on the collar diagram, and select the medium width collar numbered under that line. Take a piece of thick gold plate, shape it like Fig. 1, and solder it to the collar as seen in Fig. 2, using only solder enough to unite the end of the lever, without flowing any solder over the collar to prevent it from fitting close on the tooth. Dry the tooth, smear its neck all around with oxyphosphate cement, and force the collar over the tooth so that the lever will be in position to be pulled by a ligature, or rubber ring, after the cement has become hard, which should take at least ten minutes. The applied fixture is shown by Fig. 3. A bar regulator that is to be anchored to molars or bicuspids may be likewise soldered to collars, which can then be cemented on the anchor

teeth; or the bar may be adjustably connected with the collars, which are then fixed by cement on the teeth. Such fixed collars also serve as fulcra for jack-screws, the points of which will take on the metal of the collars so as not to slip, and yet leave the enamel uninjured. Other similar functions will be found available in the collars for regulating purposes. Split teeth may thus be banded. Large contour restorations may be expeditiously made by means of the collars set tightly on the thoroughly prepared and dried tooth, which can then be filled with gold, or gutta-percha, or cement. For cutting the collars to conform to the cervical curves, an engine corundum point or Herbst rotary file will serve the purpose, and a collar so cut is shown by Fig. 4. To keep the gold as much as possible out of view, the collar should be cut as seen in Fig. 5. Platinum collars will be required when the filling is to be of amalgam, but a gold collar may be

Fig. 1.

Fig. 2.

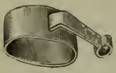


Fig. 3.

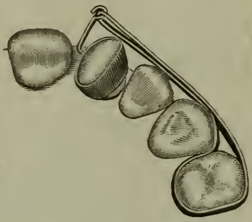
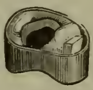


Fig. 4.

Fig. 5.

Fig. 6.



varnished with a mere film of collodion, copal, sandarac, or shellac varnish, at the part which is to come in contact with the amalgam, and then with proper care a dry amalgam will not combine with the gold of the collar. A thin collar, somewhat larger than the tooth, can be put in place, and a wedge of wood driven between the remaining portion of the tooth and the collar to form a matrix, which, after the filling has been built in it, can be removed by first withdrawing the wedge. Such a matrix is illustrated in Fig. 6, and by this means many large and complex fillings may be rapidly and perfectly constructed.—W. H. S.

Metal Dies.—To prevent imperfections or bubbles in the palatal portion of metallic dies, it is not necessary to dry the mold after it is formed, or to use more than ordinary precaution as to the heat of the metal. I find the best result is obtained when the plaster model is quite thick and the mold consequently deep. This is then tipped forward, raising the back part or condyles to the highest point possible; pouring the metal in at the front slowly, and lowering the mold at the same time until the palatal portion is covered, and the mold filled to the top. I have advised the above in many cases, and have not yet seen a failure.—F. E. Sprague.

If, in using the electric or Bonwill mallet upon teeth that are sore from wedging or any other cause, operators (who have not before practiced it) would press firmly against the tooth or filling, *in the direction of the blow*, while condensing the gold, they would in many instances save their patients unnecessary pain, and be enabled thereby to make better fillings, because of the greater amount of thoroughness the patient would be able to endure with comparative comfort. Try it, and your patients will bless you for the relief that thoughtfulness in this and like trifles will bring them.—H. D. H.

Wood polishing points, especially the large wheel-shaped ones, will wear without crumbling if, before using for the first time, they are soaked for several hours in a weak solution of shellac in alcohol, and subsequently given time to get quite dry; say about half a day.—C. D. Cheney.

THE

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ORIGINAL COMMUNICATIONS.

ARE FUNCTION AND DESIGN AND CONSCIOUSNESS ENTITIES?

BY T. DWIGHT INGERSOLL, ERIE, PA.

A PAPER on "Function: its Evolution and Influence on Organization," was read before the New York Odontological Society on the 10th of November, 1885, by Professor C. N. Peirce.

The essayist was highly complimented for his erudition on that subject, and at the same time he was severely criticised for taking the society into "the atmosphere of Marsh, of Leidy, and of Cope," and for presenting "a real hard-hearted kind of hypothesis." The paper was characterized as "a narrow and contracted view of the whole subject," because it declared that "whim, accident, or design should not and cannot be recognized as factors in tooth-development or formation." This was very objectionable,—it seems strange that it was so, as the Odontological Society is supposed to be the most learned body of dentists in this or in any other country, and it is also supposed that the members have a little pride in their scientific attainments; but why they cling so tenaciously to design can be explained only on the ground that they are decidedly opposed to evolution. If they hold to the one they must, to be consistent, denounce the other, as theology is diametrically opposed to the hypothesis of evolution.

The discussion of the paper pressed the professor so hard that he felt obliged to make a retraction to save himself from the imputation of becoming an infidel. If he had been a whole-souled believer in evolution, he would not have compromised by saying, "It was just as much design for the All-wise Father to arrange that these forms should be brought about through a course of evolution, and modified by use and adapted to their environments, as that it should be done in any other way." This, in effect, wholly ignores the Bible account of creation, and is a tacit acknowledgment of the facts and principles

of evolution, though they be contrary to the inspired record. The Bible gives no account of life except that which came through the will of the Creator, while evolution pretends to have no knowledge of life except that which resulted from the processes of evolution through the action of the physical forces. The two modes of thought are antagonistic; no relation between them being known to exist. The governing idea in the retraction was borrowed from the clergy, who had used it as a subterfuge in argument with scientific men; being the most damaging concession religion ever made to science.

A believer in evolution, with a knowledge of the principles and facts that attempt to establish it, cannot acknowledge the doctrine of design in nature to be of any value; it makes too many mistakes. The horrors attending railways, steamboats, and cyclones were once said to have been designed "for some wise purpose," but now a cause is found for them all. A clergyman who, about two years ago, undertook to portray in newspaper articles a stupendous work which he supposed the Lord had wrought in the creation of the great northern glacier which once covered all this part of the country said, "The glacier was designed for no other purpose than to break up the rocks and grind them into soil for the growth of plants, so that man and animals might be created and live." The preacher sent the articles to the present writer with a letter stating that "previous to the ice age the earth was one barren rock; not a particle of vegetation had been created." In answering the letter the mistaken man was referred to authority on the subject showing that plants had been in existence for thousands of years before the appearance of the glacier, and have been sufficiently abundant for the formation of all the beds of coal the earth contains. Design in this instance made a most egregious mistake.

It was admitted during the discussion that adaptation to environment was designed. Let us for the present accept that to be true in those beings which are the most nearly adapted to environment; but when the theory is applied to those creatures that are not so well adapted the cases are so numerous that we are forced to think the theory is not well founded. Is there perfect adaptation where almost every creature, from man down to the lowest and simplest form on the outskirts of the kingdom, is obliged to struggle continually, and sometimes very painfully, for subsistence and to escape a premature death? The doctrine of design embraces the whole of nature except where the suffering of man is caused by sin or want of conformity to moral, physiological, or divine laws. It must, therefore, be applied to man as he is unfavorably affected by floods, wind-storms, changes in temperature, contagious diseases, and many untoward circumstances over which he has no control.

Environment is also far from being adapted to all the requirements of life. A much larger proportion of life-forms die prematurely or are suddenly destroyed than those that come to a natural death. Had the adaptation been perfect there would, perhaps, have been no death.

A history of the early geological changes that have taken place on the surface of the earth would show that there had been no manifestation of life till matter had assumed a certain state or condition in which life was possible. Then came living matter into existence, without a single organ and without any permanent form. Other changes in physical matter took place; differentiation began, simple organs made their appearance, and as further changes were made other organs and forms came into existence. There were matter and force and life, but where were the entities? In what was there any design? Are all three adapted to each other? Between matter and force there is a love-tie; they are inseparably connected; the bond will never be broken; but between these two and life there is more or less antagonism. Life in some respects being an intruder on matter and the natural forces (which together constitute environment), the connection between them in every individual case is at all times in danger of an everlasting separation by death, till when the interloper lives by permission,—environment exacting a constant tribute in waste matter, while it laughs at the vigorous struggle every animal and every plant makes during its brief hour of existence to secure immortality. If life had been brought into the world through design, the animals and plants would not have been left as they were to the irritation and suffering to which they have always been subjected by changes in their surroundings, which made self-adaptation a necessity. Design is a mode of thought that belongs to theology, but not to tooth-evolution and function, especially where function is said to take "the lead in organization."

Between a well-developed organ and its functional action there is a relation so peculiar that it cannot be transferred to nor imitated by any other organ, nor can it act in any capacity previous to the formation of that organ any more than it can show action after death. It may, therefore, be seen how groundless was the fear of the Odontological Society that a mere conception of such an action would "do away with the idea of design."

Among the various modifications of structure noticed by Prof. Peirce is the following:

"Not only progressive but also retrograde modifications take place in this effort at adaptation and specialization in response to the influence of function. During the progressive evolution of higher or-

ganisms there is frequently a retrograde process of evolution in individual parts, illustrated in the absorption of the roots of deciduous teeth and of numerous other organs which have become rudimentary in consequence of having become useless to the organism. This is true of the human family as well as of other species."

If this theory is true regarding teeth, there is sometimes in function a want of foresight in making the roots of the deciduous teeth too dense and enduring for them to be removed in time for the eruption of the permanent teeth without retroaction on the part of function. If function claims to have thus influenced the development of the first set, and assisted in displacing them at a given time, a failure in design must be acknowledged—a design to get rid of the bad effect of a previous design! Can it not be understood that the life-forces in the mother and child are not able to cause the first set to remain till old age? They are only sufficient in structure for temporary use, and we must attribute their removal to environment and its effects. Similar ideas have been advanced in other societies in regard to the supposed retrogressive action in the destruction of one or more of the mother's teeth for material to be used in the formation of teeth for the infant. The theory that the organic forces sometimes tear down one organ to build up another is as unreasonable as it is unscientific, and it would be well if it were so regarded throughout the profession. It is the physical, antagonistic forces that destroy here and there an organ, and in time kill every animal and every plant. Scientifically there are no forces in nature but the physical. We speak of organic forces to distinguish those that are intimately connected with living beings from those that operate in the physical world. The distinction between law in the domain of physics and law in the animal and vegetable kingdoms is but slightly marked, all life being entirely dependent on matter and its "immanent" forces. The position thus taken by scientific men is in perfect accordance, it is claimed, with the facts.

It may now be seen how unscientific it was for Dr. W. H. Atkinson to speak against the professor's paper because it "wholly ignored the consciousness," just as though consciousness in evolution was absolutely a necessity. Is gravity a conscious force? Is there consciousness in the crystallization of minerals or in the radiant energy of the sun? Physical nature knows nothing about consciousness; that belongs to a world of thought, having been experienced only by a being of some intelligence. No consciousness is seen in a stone, in a block of ice, in the lightning-like rapidity in the vibration of pent-up gases, nor in the great elasticity of the infinite ether. In the vegetable kingdom no consciousness is seen in the mustard-seed, in the growth of the great redwoods and oaks, nor in anything

else till we approach the sensitive plants, the climbing and twining plants, and those carnivorous plants which allure, entrap, and devour insects for food. If we would leave the vegetable self-climbers and the self-retreaters and the self-feeders, and pass into the animal kingdom, nothing like consciousness would probably manifest itself till the higher animals were under observation, in which some think they discover animal mind; but no one can prove that the best-educated and the most sagacious animal is really a conscious being.

Consciousness is not an entity, as some suppose; it is, as Webster defines it, "the knowledge of sensations, or of what passes in one's own mind." A man, then, according to that definition, may be conscious of having consciousness! Of what scientific value is that to him? It is freely admitted, however, that consciousness is more or less experienced by those of common intelligence; but its infallibility as a truthful guide is strenuously denied. It is not to be trusted under all circumstances; for at a given time one may feel that he has truthful knowledge of certain sensations, and at another time he may be just as conscious that that supposed knowledge was not really true; he was conscious of having made a mistake. Consciousness is a graduated scale without a zero, having no starting-point from which a reckoning can be made. Where consciousness begins or where it ends no one knows.

Before concluding this paper it may perhaps be well to inquire if the controversy between science and theology (which is beginning to agitate the dental profession) will probably prove to be of much benefit. Theology we may suppose would keep the dentist honest in his practice, while he who studies scientific principles will become more scientific. These embrace the human race and all kinds of life as well as all inorganic matter. It is not enough to study a human tooth; the life of its possessor, and other teeth and lives, and the nature of the forces and influences affecting them, should become part of our knowledge. Every creature comes generally into being within its own environment,—that of the species to which it belongs,—but, if born in one that is not favorable to a continuance of life, the creature dies before self-adaptation can take place, or it "ekes out a miserable existence" till it meets a premature death. This to a certain extent applies to civilized man. He is not living in his original environment; it has been changed somewhat by nature, and we need to know whether a partial adaptation to his present surroundings and conditions is sufficiently perfect for his best good,—whether climatic and geological changes have had any effect on his teeth. We need to know more about heredity. Is man's present physiological condition an inheritance of his original pre-Adamic state? These inquiries must be answered on a basis of facts

and scientific principles. No supposed functional entity, nor any theory of design in nature, can be of any avail. If the present condition of the human family were correctly known, it would probably be seen that the life-forces are only just sufficient to form small, porous, short-lived teeth for the infant, which will be destroyed in a very few years. It is all that nature can do for the tender child with what materials she has at hand; but, subsequently, having more energy and different nutriment, she may be, and generally is, able to supply a better and more durable set of teeth for the youth, though in many instances decay commences before development is complete, and the teeth become painful and useless before reaching the meridian of life. A loving, benevolent, and All-wise Designer would have caused a more perfect set of teeth,—so perfect that chemical action in the mouth would never cause their destruction.

If the statements in this paper are in keeping with the facts in nature, it may be inferred that the dentist would do well to draw a distinct line between scientific questions and those that relate to morals and religion. Let the principles of Christianity govern in our dealings with our patients, holding fast to that which is good in theology, but in our treatment of the life and health of the dental organs let us be guided by facts and the fundamental principles of science.

ON THE LIMITS OF USEFULNESS IN DENTAL OPERATIONS AND THE PRESERVATION OF UNFIT TEETH.

BY ALTON HOWARD THOMPSON, D.D.S., TOPEKA, KANSAS.

(Read before the Kansas City Dental Society, April 20, 1886.)

The impetuosity which has characterized the growth and progress of dental science and art of late years presents some features which, to the conservative and cautious mind, make that progress not altogether satisfactory. These features suggest grave doubts as to the really practical benefits to be conferred by some high-class operations which we perform nowadays, and as to their durability and permanence if serviceable.

We are proud, and justly so, we think, of the wonderful discoveries of our leading experimenters and inventors, whose productions the mass of the profession are quick to adopt and apt in learning to apply in practice; and we have become so accustomed to performing wonderful things every day in the preservation of diseased teeth and the reproduction of lost dental tissues, that we scarcely stop to consider how wonderful our creations really are, but think only of reaching forward to the accomplishment of still greater things. This is a laudable ambition, for it is the earnest of yet greater

things to come. We discuss our triumphs with a complacency born of our satisfaction with our marvellous success in the preservation of everything in the way of teeth, or fragments of teeth, whose lost parts may be restored in gold or porcelain, or upon which artificial substitutes may be erected. Of recent years our artistic attainments have reached a height undreamed of in the student days of most of the dentists in practice to-day. This is especially true in the new field of crown and bridge-work.

But to the cautious and conservative mind there will often come the disagreeable thought, like a misgiving, that the progress of the day in dentistry is too much toward high art, regardless of physiological requirements. The ambition is to produce artistic dental jewelry, without scientific consideration of the anatomical limits of endurance, or the possibilities of duration in the vicarious performance of the physiological duties of the teeth, and of the pathological dangers involved. Regarding the underlying scientific principles, there is a reckless ignoring of these considerations which cannot but be disastrous to the parts and the structures. There is a too lavish expenditure of time, strength, and expense by both patient and operator for the service rendered. The patient is not compensated and the operator is not honored by a structure which but indifferently and briefly performs the work of the lost parts which it replaces.

As an extreme example, the writer recalls a very artistic production which consisted of the entire upper denture made in one continuous piece of bridge-work, supported upon three anterior teeth. As a piece of dental jewelry it was magnificent and unapproachable by the ordinary dentist; but as a piece of prosthesis it promised only failure, and of course led soon to the loss of the supporting teeth. That piece was inserted in reckless disregard of the anatomical limits by which bridge-work is hedged, and of its ability of performing efficient service as a substitute for the lost teeth.

This is an extreme example, of course, but too much of the bridge-work of the day is of the same reckless, unscientific kind, differing only in degree. There is too much mechanism and not enough science about it. The worship of art leads to overtaxing nature. The teeth and roots are asked (perhaps expected, if the operator thinks about it at all) to support more than nature ever intended that they should,—more than they or their environments were constructed to support, either anatomically or physiologically,—and must in a brief time succumb to the unusual strain. A tooth or root is designed to support one crown and no more. Nature will not long endure multiplied burdens. In rare cases, perhaps, one or two teeth can be supported with safety between and by two very

strong teeth or roots, but even that load is assuredly overtaxing those teeth, and nature will revenge the transgression in time. And then regard should always be had to the organization of the teeth before a piece of bridge-work is inserted, and none but the strongest should be asked to endure it. The majority of the people who are obliged to seek the services of the dentist possess teeth which are too weak to bear more than their own share of the work, and are scarcely strong enough for that.

We must bear in mind that the teeth of civilized man, as well as their supporting environments, are much weaker than those of the savage. The teeth in the higher races are being gradually reduced in accordance with the workings of evolution, and are therefore more or less rudimentary and immature. And thus, while scarcely able to endure the legitimate work required of them, it is rank folly to overtax them with burdens which we could safely put upon the teeth of the savage or the ape, because they possess much superfluous strength. By asking it of such teeth we only cause their premature exfoliation, and anticipate that edentulous condition which is the accompaniment of old age, or perhaps of the coming man.

To the expectations of usefulness of crown and bridge-work there are limitations which cannot be ignored. Recent writers are beginning to recognize these limits, and speak less confidently of the unlimited extent to which the work may be applied. One directs that the supplied teeth should be freed from occlusion, and another that, as the supporting teeth will elongate in time, allowance must be made for this in the bridge teeth supplied. Again, we are told that a piece should be removable, to treat the supporting teeth, which are liable to abscess. These are fatal admissions. They point plainly to the results that the cautious scientific mind anticipated and saw must ensue when the work was first proposed,—i. e., that the irritation produced by the excessive strain upon the supporting teeth would inevitably lead to exfoliation or abscess sooner or later.

Another important matter which has not received the consideration which it deserves, is that the loss of the natural interstitial motion of the teeth for a time must also be a source of periosteal irritation, until the ultimate failure of the piece. We say *for a time*, because two teeth cannot be bound so firmly together by any known device as to entirely prevent movement in the sockets; but will soon regain their freedom, and at the cost of the loosening and failure of the piece. All mechanical structures should be constructed on philosophical principles, and in the construction of bridge-work no principle is so important as the interstitial motion of the teeth.

The teeth have various motions: (1) interstitially,—i. e., from tooth to tooth; (2) between outside and inside; (3) partial rotation in the

sockets; and (4) perpendicularly in the socket. These motions are caused principally by use in mastication, and are imperceptible to either sight or feeling. They are also caused by the motions of the tongue, cheeks, and lips in speech, and by movement under tension of the circulation. In view of these facts it is remarkable that bridge-work dentures have not been constructed with a view of accommodating these motions. As no two teeth can move in unison, they should not be bound like slaves together. Allowance should be made for rotation, and for lateral and perpendicular motions. If this were done the pieces would be more durable as regards their attachment to the supporting teeth. The hinge, the tube and rod, the swivel, incased teeth and telescoping crowns, and other mechanical accessories, should be employed to provide for this motion, for without such contrivances the motion will cause the cement to loosen from its attachment and the piece will give way. But the ignorance displayed in this respect is only one of the phases of the utter disregard of scientific laws and limits to which the bridge-work artist is addicted, and is more or less characteristic of the craze.

Then there is the hygienic side of the question, in view of the doubtful cleanliness of bridge-work when in use. Its advocates claim that it can be kept clean and wholesome, but as no artificial denture can be well cleansed unless it can be removed it is to be doubted if this is true. Perhaps a strong antiseptic wash frequently used would prevent fermentation, but mere rinsing cannot remove the débris. At any rate, patients *do not* keep them clean, either because they will not or cannot, and the retention of débris is a very serious objection.

It is to be feared that, when many of these magnificent productions begin to give way and good teeth are lost because of them, there will be a reaction which will go to the other extreme, and create a distrust of the work which will lead to its wholesale abandonment. That would be most unfortunate, for the work has its uses in places where it can be advantageously employed. It would be better to call a halt and put the brake upon our impetuous progress in this direction in time. It would be better to consider well what we attempt to do,—not to overtax nature, and be sure that we do not exceed the limits of usefulness in order to merely produce highly artistic results. This caution will preserve to us a useful class of work for a limited number of cases; but the abuse of it and its unlimited application will lead to failures. And these will create an unmerited prejudice against and abandonment of it.

But in other departments, also, there is danger that we may exceed the limits of usefulness. In the field of the medical and surgical treatment of the teeth and their surroundings we may

overreach the requirements of service in preserving teeth which are unfit, and which merit only extraction. Our success in the treatment of diseased teeth has been phenomenal in the history of surgery, and is second only to our artistic productions. But there is little doubt, for instance, that we preserve too many ulcerated teeth, especially in locations where they are of little or no service to the patient. A second or third molar without an antagonist, which is in a chronic state of ulceration, the cure of which involves a tedious course of treatment with a doubtful result, had better be extracted. There is always a doubt as to a chronic ulceration being permanently cured; especially with unfavorable organizations. There is a strong probability that the parts will remain in a dormant irritable condition, a nucleus for neuralgia, and possibly for final and severe abscess.

We do not discriminate rigidly regarding the preservation of such teeth, but press the practice of retaining everything in the shape of teeth to injudicious extremes. We are bound to admit that the strictures of Dr. Sexton and others were not without justice,—accompanied, as they were, by a great deal of injustice. Many dead teeth have been put in such a healthy condition as to remain as free from irritation as any live tooth in the same denture, and thousands of such are doing faithful service to-day. But we cannot deny that there are other thousands that are dormant volcanoes ready to break out upon cause, or which are the potent source of neuralgias or of reflex ophthalmic or aural diseases. It is such as the latter that we should endeavor to select from the class of dead and ulcerated teeth as fit only for removal, and whose retention would be a positive harm to the possessor. We need to exercise an exact scientific discrimination between the diseased teeth which should and those which should not be preserved,—taking into full consideration all the bearings of the tooth with regard to its usefulness as a masticating organ, the presence or absence of an antagonist, the health of the environments, the condition of the crown, its value as regards speech or appearance, and, lastly, the organization of the patient with reference to the general health, temperament, and the recuperative powers, both present and prospective. The measure of a tooth's usefulness should always be taken before any operation is performed upon it, and especially when dead and diseased.

It cannot be denied that we have swung too far in the direction of the indiscriminate preservation of teeth. We have become unreasonably prejudiced against the extraction of teeth, and have come to regard it almost as a crime, as of the wanton amputation of a limb. But limbs must be amputated sometimes to save life, and teeth must sometimes be extracted for the benefit of the patient.

We lose sight of this truth too often, and endeavor to preserve teeth without sufficient regard for the welfare of the parts or the usefulness of the tooth. In this, as in all matters pertaining to our specialty requiring careful discrimination, an educated scientific judgment should be brought to bear, that the best results may be attained.

Not only in the class of dead and ulcerated teeth should extraction be more frequently resorted to, but also in the class of carious teeth requiring merely filling. A carious tooth in a crowded arch should often be removed in preference to filling, that the remaining teeth may become spaced and thereby have a better chance of escaping caries. The upper bicuspids or the first molars in either jaw often present conditions which, taken in conjunction with the crowded or even only closely set position of the teeth, would indicate that their removal would be better for all parts concerned than their preservation by filling. If soft teeth are closely opposed, caries is certain to ensue in the bicuspids, and one or more of them, or the first molars, will as certainly be lost. With that probability staring us in the face, would it not be better to extract the carious tooth at once, that the remaining ones may have a better chance? All those who have been in practice ten years or more have cases in which they now perceive that it would have been better for the denture to have removed such teeth, and now regret not having done so in time; and they will also have cases in which they have removed bicuspids or first molars for crowding, and in few of these will they see cause for regret. Does not this experience of every one bear its lesson?

A recent writer remarks upon what we all have noticed,—i.e., that all the teeth of a denture are not of the same quality, and that a pair—most often bicuspids or first molars, and more rarely the second molars—will succumb early, and that they should often be removed. Another also makes the correct statement that it is as much "the business of the dentist to extract teeth that ought to come out as it is to save teeth that ought to be saved;" and he takes every opportunity to denounce the obsolete sentiment that "it is the business of dentistry to save teeth."

As the wisdom-teeth are always less dense in structure than the other teeth in the same denture, the desirability of preserving them in dentures which are at all crowded must always be doubted; and as they, more frequently than any other teeth, give rise to reflex irritation, their removal is often preferable to filling when much effected by caries,—and especially when the pulps are dead,—unless other conditions demand their retention for service. When the other molars are lost, and they are required for mastication, of course every reasonable effort should be made for their preservation.

Perhaps in the field of prosthesis we often overreach the limit of usefulness and insert dentures when they are not required. An article upon hygiene appeared in a popular scientific journal some time since in which it was stated that the dentist of to-day was becoming too skillful,—especially in view of the fact that he replaced lost teeth in the mouths of old people so perfectly that they were taught to masticate food which was too solid for their enfeebled stomachs to digest,—the point being that, as the stomach and digestion weakened and failed with age with the rest of the economy, there should be a return to the simple diet of childhood or infancy, or one which would require as little effort to assimilate as possible. This the dentist counteracts by his skillful work. The indictment is a curious one, at least, and is perhaps worth consideration. Perhaps, also, in other classes of cases we insert artificial pieces which are superfluous if not injurious.

In other fields we should always bear in mind the possibilities of usefulness and effective service of our operations, and not let our skill overreach our obligations to the patient, which is to render the service which will be for the most good. We are merely the skillful servants of our fellow-man, and we owe it to him to serve him well.

But we are not alone in allowing our pride of skill to exceed the limits of usefulness. The oculist who preserves unfit and injurious eyes, the surgeon who preserves unfit limbs,—perhaps the physician who preserves unfit lives,—are exceeding their duty to their patients and to the race.

Indeed, charity and science are exceeding themselves in our day in preserving the unfit to propagate disease and infirmity. The workings of that most excellent natural law of "the survival of the fittest in the struggle for existence" is set at naught by civilization, which is overreaching itself. It needs to be diluted with a little wholesome barbarism in this matter of the preservation of the unfit to contaminate the entire race. Charity and science are together going too far in the retention of that which is diseased, which had better often be sacrificed for the benefit of that which remains.

DENTAL CARIES.—IX.

BY A. MORSMAN, M.D., D.D.S., IOWA CITY, IOWA.

(Continued from page 278.)

PART THIRD—SEQUELÆ.

2. Lesions of the Pulp.

Acute Inflammation—Pulpitis.—Inflammation of a tooth-pulp as a sequence of caries does not differ from inflammations elsewhere. The general symptoms are the same,—pain, heat, redness, and swelling. The pain is of a character familiarly known as "jumping tooth-

ache." The swelling is limited by the walls of the pulp cavity. The heat is not perceptible because of the small portion of tissue involved. Inflammation here passes through the same stages also as elsewhere, —irritation, congestion, inflammation, and suppuration; and the symptoms and amenability to treatment differ with the different stages. Resolution never, or at least rarely, occurs. The process is always one of destruction or permanent chronicity. The pathology of general inflammation does not belong here. The student should have familiarized himself with that before taking up the study of dental pathology. We shall consider the disease in its separate stages.

Clinical History and Pathology.—The first remove from normality in an exposed pulp is when, responsive to thermal changes, pressure, and its unnatural surroundings, there is an increased influx of blood and an irritability marked by pain of long or short duration, spasmodic and of increasing severity. This is denominated the stage of irritation. The ashy color of the pulp has disappeared, and it has taken on a decidedly pinkish tinge, which becomes gradually deeper until the dark red of congestion is reached. The circulation is rapid, and, the disease being unchecked, the capillaries soon become engorged with blood; swelling occurs to the limit of its confines, and the pain becoming almost constant, grows more and more severe until it "jumps" and throbs with every pulsation of the heart. This is congestion, and the disease is fairly established. Soon there is a slight exudation from gorged vessels, and the pain becomes more bearable. It is now that we see the anomaly of a pulp quieted by cold and irritated by warmth; hence we have nocturnal pains of great severity after the patient is warm in bed. The inflammation is now at its height, and the disease may take either of two courses: *Regularly*, suppuration soon follows, and the pulp is coated with a creamy pus. Pain is much lessened, or ceases entirely, only to become again acute when subjected to unusual irritation. Gradually the bulbous portion of the pulp dies, and the filaments in the root-canals follow, but often with remarkable slowness. These filaments seem to die little by little, and they may remain sensitive to irritants for weeks, and even months, until finally the examining probe goes painlessly to the end of the canal. The smaller the canal the longer the time required for this process. Or, not pursuing the regular course, the symptoms abate, the pulp retains its increased size and color, but loses in a great measure its sensitiveness. The case now comes for consideration under chronic inflammation.

Diagnosis.—It is easy to recognize this condition by symptoms alone. Pain is all important, and points with almost unerring exactness to the period of the disease. In the first stage it is not con-

tinuous, but occurs at intervals, the spasms being of short duration and perhaps several hours apart. Cold air or drinks bring on exacerbations of pain, and these are allayed by protecting the cavity or by warm applications. During congestion the pain, if not continuous, is only remittent. It is severe, throbbing, and unendurable. Warm and cold applications both increase the paroxysms when in its first inception, but later cold gives marked temporary relief. Nocturnal pains are almost universal in the later stages, and, periostitis excluded, are pathognomonic. During suppuration the violence of the pain subsides, and the pus is visible on examination. Death is diagnosed by entire absence of pain and lack of sensation to irritants.

Thus, we need as aids to diagnosis, if we cannot get sufficient information by well-directed questions, the syringe with cold and warm water, or cold and warm air, and the pulp-examining probe. With these there is no reason for failure. The only difficulty that is at all likely to occur is in the very beginning of the disease.

We have only to differentiate between this disease and acute periostitis. In the latter the pain is dull and heavy, the tooth is sore to the touch, to tapping with an instrument, and is often loose and feels elongated. All of these symptoms are simulated occasionally by pulpitis; indeed, I believe pulpitis rarely occurs without more or less periostitis accompanying it; but the symptoms have not the same severity.

An examination will demonstrate whether the pulp is alive or not, and so long as any life exists in the canals the periostitis is only secondary, and its resolution may be confidently anticipated.

Pulp nodules cause pain somewhat resembling the pain of pulpitis, but it is not as severe, and is likely to have a history extending over a longer time. They are not sufficiently frequent to be much of an element in diagnosis. No mistake could be made either in the treatment.

In many cases the pain, instead of being confined to the tooth, extends over the whole side of the face. This is usually in the early stages of the disease.

Treatment.—In the early stages of the disease, when we have only irritation to combat, there is a long list of remedies that will give relief, and as treatment is only preparatory to devitalization,* any relief-giving application is of advantage. Carbolic acid, oil of cloves

* I wish to be plainly understood as condemning capping as inapplicable to a pulp that has once been inflammed, even in the early stages. Some time ago, when capping was the rage, when the destruction of a tooth-pulp was denounced as a crime, and when the journals were teeming with infallible methods, I took it up with an energy that nearly ruined my practice. I selected my cases, treated and capped not by one method, but by many, and with a perseverance worthy of

and other essential oils, creasote, opium and its preparations, menthol, camphor, turpentine, varnish, chalk, chloroform, thymol, and many others are in use either by the profession or as household remedies. The first three are very efficient, and leave nothing to be desired. They relieve the pain in a very few minutes, and will keep the tooth quiet from twenty-four hours to five or six days. Personally I am opposed to creasote when something else will do as well. The odor is very disagreeable, and the taste excessively so. A favorite preparation is a mixture of carbolic acid and oil of cloves, equal parts. The manner of making an application† is to moisten a pellet of cotton with the remedy selected; remove excess by touching it to a bit of blotting-paper or a napkin, and place it in the cavity. Overlay this with cotton, or cotton and sandarac, to maintain it in position. It should keep the tooth comfortable for twenty-four hours, when arsenic can be applied as described in the preceding article. Arsenic should not be used without this preliminary treatment, as it does not act upon inflammed tissue except very slowly, and it increases the pain.

The treatment of congestion is similar, but it may not yield so readily. Here carbolic acid, full strength, is very efficient in the large majority of cases; but more than one application may be required, although usually that is sufficient. When the inflammation is at its height, this treatment is sometimes an aggravation rather than otherwise, and then an application of oil of cloves is soothing, and may be quite sufficient. Creasote is here preferable to carbolic acid. Indeed, we are sometimes compelled to try a variety of remedies, for what was once so easy to control is now quite difficult. The dental tincture of aconite and morphine‡ has been highly extolled, but I have not been very successful with it, although I have succeeded quite well with the officinal ointment of aconitia.§ Care must be taken that there is at no time pressure upon the pulp. Should the case present after the bulbous portion of the pulp has died, and the fibrils are still living, arsenic may be applied to them at once without preliminary treatment, but rapid devitalization need not be expected.

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better results. It was a misdirected effort. With very few exceptions my cases were all lamentable failures. My practice was not "transients," and there was no room for self-deception. With that experience I cannot advise pulp-capping as proper treatment for this condition.

† To practitioners these details are doubtless wearisome. To students they are essential.

‡ An unofficinal preparation. See DENTAL COSMOS, Vol. xix, page 172.

§ This preparation is so variable that it cannot be relied on. It has occurred to me that the oleate would be a better form in which to use this remedy, but I have not yet tried it. Aconitia is very expensive, and requires great care in its use.

In acute inflammation, when there has been no nocturnal pains, if the tooth can be kept painless for twenty-four hours, the arsenic can be applied with the expectation that it will act rapidly and with little or no pain. If it does give pain that is not to be accounted for by pressure of the stopping, the application should be removed, and the tooth again placed under preparatory treatment for a longer time. This is only exceptionally necessary. These nocturnal pains mark a period in the disease after which it yields less readily to treatment, and we should not, therefore, be in a hurry with the arsenical application, although in the majority of cases it can be safely applied after twenty-four hours' freedom from pain. If the patient is conveniently located it can be tried, and if unsuccessful removed. Otherwise, it is better to simply renew the previous application rather than to give much pain, and thereby delay our proceedings for a longer time. In all cases of pulp treatment avoid excessive handling. Once in twenty-four hours is sufficient and better than oftener. If pain occurs in the interval the patient should present himself as soon as possible. In this event one of two conditions exists,—either there is pressure or the remedy used is inefficient. If the case is in the first stages, suspect pressure; but if in the later stages, suspect the remedy, and change it, *always for a milder one.* If carbolic acid has been used, try creasote or oil of cloves. If either of these, try aconite. Sometimes a capsicum plaster or bag placed over the root of the affected tooth will aid by counter irritation. A saline laxative or hot pediluvia are often excellent adjuvants. If cold gives relief, let it be used. Holding cold water in the mouth or an ice-bag applied to the face are ready methods of application.

The most aggravated cases of pulpitis I have ever had were cases where arsenic was too hastily applied.

Occasionally, in post-operative caries, a filling still remains in the cavity and obstructs operations. It should be removed or perforated, or entrance made elsewhere, as may seem best, the considerations being accessibility with least present annoyance to the patient.

Chronic Inflammation.—The history of this disease may have been in its beginning the history of acute inflammation, or it may have exhibited from its inception the sluggishness of chronicity. It is remarkable how an organ so exquisitely sensitive as a dental pulp, and which has been so well protected from detrimental influences, can, when exposed, become so apathetic to these influences. Chronic inflammation of the pulp presents this anomaly,—almost or quite without sensation, it bears the pressure of foods in mastication. If irritated by some unusual stimulus, removal of the cause is usually sufficient to restore comfort. Thermal changes seem to have but

little influence upon it, and even pricking or cutting it produces but a languid response. The appearance does not differ greatly from that of acute inflammation. The pulp is red, approaching purple, and is constantly congested and swollen. There is no stasis, and but little exudation. Suppuration is uncommon, except where it becomes acute. The tendency is towards hypertrophy, although it is at any time liable to be sufficiently aroused to take on the acute form of the disease with all the consequent pain and discomfort. It gives no symtoms of much value, and is to be diagnosed by exclusion. The patient has often no knowledge of its existence, and the operator may only find it on examination. The time that a pulp may remain in this condition is indefinite. That they often do remain so for many months is the experience of every operator.

The treatment does not differ much from that applicable to the acute form. The arsenic can rarely be successfully applied without a preliminary application of carbolic acid or creasote, but so long a time need not be prescribed as in the acute disease. Often an hour or two is sufficient, but it is safer usually to allow an interval of eight to twelve hours before the arsenic is applied, which should be after the manner already described. It will act slowly at best.

Hypertrophy.—Resulting from chronic inflammation or a continued irritation, the pulp becomes enlarged from hyper-nutrition, and a tumor is formed which may become of considerable size. It is usually polypoid in shape, very red, and is said to sometimes fill the entire carious cavity. It is usually painless, although tender to the touch. It is sometimes, owing to its size, so exposed that it receives the constant pressure of mastication without irritation. It is easily recognized, but is liable to be confounded with hypertrophy of the gum, which it very closely resembles, especially in those exceptional cases when it grows to very large size and fills the carious cavity. The disease is much more common in the gum-tissue than in the pulp, and the sensitiveness is also much less. Tracing the attachment of the pedicle will settle all doubt.

Treatment.—Work carbolic acid around it with a probe, on which a few fibers of cotton are twisted, until the surface at the base is cauterized. Take a large, sharp, spoon-shaped excavator; moisten it with carbolic acid, and insinuate it under the tumor until the pedicle is reached; then sweep it quickly and firmly across the pulp cavity so as to sever its connection. Saturate the stump with carbolic acid, and apply arsenic for devitalization.

Gangrene.—Tooth-pulps are said to become gangrenous as a termination of inflammation. I have never seen a case that I thought merited that name. Often in process of death and decomposition they become excessively malodorous, but the odor does not seem to

me to recall that of gangrene. The odor does not differ perceptibly from that given by the contents of the canal in a case of alveolar abscess.

THE EVOLUTION OF ARTIFICIAL TOOTH-CAPS AND CAP-CROWNS AND BRIDGE-WORK.

BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

PICTORIAL illustrations of useful things, by means of the engraver's art and photo-lithographic processes, have become the preferred method of presenting to the mind a precise idea of appearances which, however well described in words, could not be so realized in detail as is entirely practicable through the medium of pictorial representation.

It is an indisputable fact that many useful devices of ancient peoples have been lost sight of by reason of the absence of actual depiction in books or manuscripts which contain allusions to or descriptions of such devices in words that fail to convey definite instructions, or to so fix the reader's attention as to incite an effort for the reproduction of the things described.

Examples of such facts in relation to subjects of interest to the dental profession are here presented, with illustrations of some devices which were so described as to enable those skilled in the art to make and apply them, yet, lacking the attractive effect produced by depiction, the inventions failed to gain general acceptance by the profession.

FIG. O.

FIG. P.

Dr. William H. Dwinelle, in the *American Journal of Dental Science*, April, 1855, pages 278 and 279, illustrates and describes a porcelain-faced ferrule or collar. He previously describes a porcelain-faced *cup* with a perforated bottom, which rests as a floor on the flush end of the root, to which the floor is secured by headed screws passing through the perforations of the sheet-metal floor into threaded holes in the root. The cup is then filled with crystal gold. The cuts are referred to as Fig. O and Fig. P. He proceeds to say, page 279, "A gentleman of my acquaintance has, for several months past, worn an artificial cusp and crown of this general character upon a root which contains undisturbed its *living* and healthy nerve. By accident the natural crown was broken off, but in such a manner as to leave a large portion of the central part of it covering the nerve, and which protruded down so far that, by cutting a groove around its base, it somewhat resembled an inverted cone. Gold was packed around this until it nearly reached the outline of the root, when the prepared cusp and crown" (collar), "Fig. P, without its staple or screws, and which had been previously fitted, was secured

to its place. The *tubbing*, or gold-bound cavity, was then filled with gold as described above." Fig. 1 is the same as "Fig. P without its staple or screws." Fig. 2 is a sectional view of such "Fig. P." Fig. 3 is a like sectional view of the described root, groove, "inverted-cone" shaped "part of it covering the nerve," the gold packing the retaining-groove, and "nearly reaching the outline of the root." Fig. 4 is a like sectional view of the porcelain cusp and "tubbing" "filled with gold" in place on the root. Fig. 5 is a perspective view of the finished collar crown.

Dr. B. Wood, in the DENTAL COSMOS, December, 1862, page 243, presents an article entitled "Enameling Plugs, and Restoring the

FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

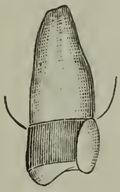
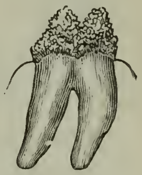


FIG. 6.



Contour of Defective Teeth by the Application of Enameled Caps." He says, "The design of the improvement is to restore the form and beauty of decayed and broken teeth, at the same time preserving as much as possible of the healthy dentine, and also to conceal the metallic plugs by means of a cap or covering resembling the sound parts of the teeth. . . These caps are from the size of a medium large plug to that of the entire crown of the tooth. They are made,

FIG. 7.

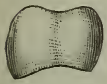


FIG. 8.

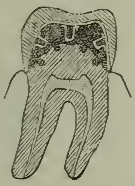


FIG. 9.

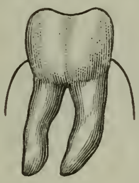


FIG. 10.

according to circumstances, with grooves, slots, cavities, orifices, serrations, or with asperities made by means of platina scraps at the base, in order to retain the filling, and are then to be adjusted to the tooth or fragment of tooth properly prepared to receive them. . . In this way entire crowns may be engrafted upon the remains of teeth, back as well as front, and without removing living nerves, as is done in excising and pivoting teeth according to the ordinary plan. . . I have assumed the plastic metallic filling as the material to be used for engrafting the caps to the natural base, but it will occur that any plastic material possessing sufficient tenacity

and otherwise suitable would answer the purpose. It will also occur that caps may be formed of thin gold or platina plate, and applied in a similar manner."

Fig. 6 shows a living molar the enamel of which was imperfectly formed and has disappeared. Fig. 7 shows a porcelain covered platinum cap-crown, provided on its interior surface with soldered platinum scraps to retain the filling. Fig. 8 is a vertical section, and Fig. 9 a perspective of the cap-crowned tooth. All other like denuded

Fig. 11.

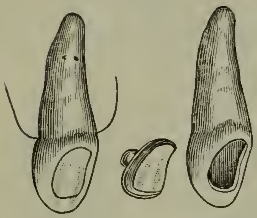


Fig. 12.

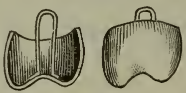
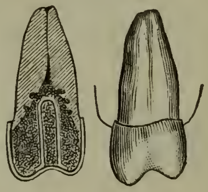


Fig. 13.

Fig. 14.



teeth of every kind could thus be entirely crowned. Typical instances of similar partial restoration are seen in Figs. 10 and 11. An example of a thin gold cap, likewise mounted on a pulpless root with oxychloride of zinc, is illustrated by Figs. 12, 13, and 14. These instances cover the whole field of porcelain-faced and mere metallic tooth-caps, either entire or partial, and provided with retaining platinum scraps or other devices to be imbedded in the plastic inclosed by the caps when in place on the prepared teeth or roots, as described by Dr. Wood, who at first intended to patent his invention, but by this publication gave it to the profession.

It is probably due to the absence of illustrations that some readers

Fig. 15.

Fig. 16.

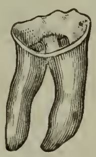


Fig. 17.

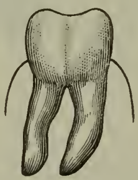


Fig. 18.

Fig. 19.

Fig. 20.

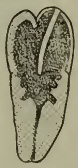
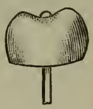


Fig. 21.



of this journal were able to subsequently make unchallenged claims to these old devices as new.

Dr. Wm. N. Morrison, in the *Missouri Dental Journal*, May, 1869, page 184, describes a gold shell formed on a metal die, shaped like a natural tooth-crown, and having a bar soldered to opposite sides of the shell, a section of which would appear as seen in Fig. 15. Fig. 16 is like the root described by him, and Fig. 17 resembles the completed crown.

In the DENTAL COSMOS for November, 1876, page 585, Dr. E. A. Bogue is reported as saying, "Dr. Williams, of Boston, sent me two or three little gold toad-stools, in shape, requesting that I exhibit them. I have not got them with me. They are the device of Dr. Fisk, I think, of Massachusetts, who has used them by filling teeth with gutta-percha, then warming this gold and pressing it home. The gold is somewhat the shape of an umbrella, the tent of the umbrella being shaped as the surface of a large gold filling would be, so that you have a gutta-percha filling and the gold cap as a protection to the gutta-percha."

FIG. 22.

FIG. 23.

FIG. 24.

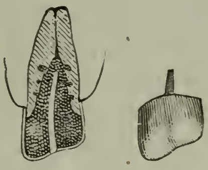


FIG. 25.

FIG. 26.

FIG. 27.

Fig. 18 shows one of the "little gold toad-stools, . . . somewhat in the shape of an umbrella," and Figs. 19 and 20 show the same mounted on a bicuspid with gutta-percha. Fig. 21 shows one shaped as a "large gold filling," and Figs. 22 and 23 show a tooth-root and the pivoted cap mounted on the root with gutta-percha as described. Obviously oxychloride or oxyphosphate cement, or amalgam, would likewise serve to fill the cap, surround the pivot, and attach the device to the root in the manner since so well known. (See Fig. 24.)

Dr. C. E. Francis says, page 586, "I am told that fragments of broken teeth have been strapped or bolted together, but how, when, by whom, and with what degree of success, I have not yet learned. My first effort in this direction was to restore a hopeless-looking bicuspid. This was eighteen or nineteen years ago. All that remained of the crown was a mere section, only part of a cusp, connected with the root by a slender line of partly decalcified tooth-structure. After careful preparation, I made a band or ferrule of gold plate, one end of which" (ferrule) "I fitted to the tooth. Then, warming it over the flame of a spirit lamp, I lined the inner surface with Bevins's

FIG. 28.

FIG. 29.

FIG. 30.

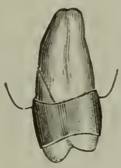


FIG. 31.

FIG. 32. FIG. 33.

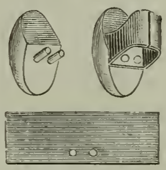
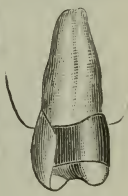


FIG. 34.



stopping" (gutta-percha), "and slipped it over the cusp securely to the tooth. I immediately packed the entire space with the stopping, leaving only the extreme point of the cusp visible. . . . Since then I have saved a great number of broken teeth in a similar manner, and most of them are doing good service at the present time; have used gold bands and platina bands, and filled them with gold or amalgam,—always, however, first packing Bevins's stopping" (gutta-percha) "securely against the roots."

Fig. 25 shows such a bicuspid having only part of a cusp remaining; Fig. 26 the band or ferrule of gold plate; Fig. 27 a section of tooth and ferrule, and Fig. 28 the completed operation. Fig. 29 shows a split bicuspid, and Fig. 30 the same banded. It is thus made evident that gold bands or ferrules or collars were fitted and cemented to teeth and parts of teeth as early as April of 1857 or 1858.

Fig. 35.

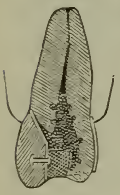
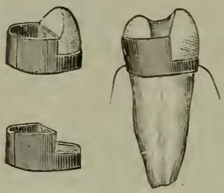
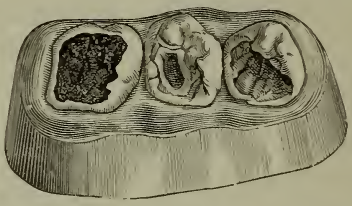


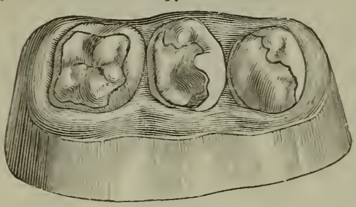
Fig. 36.



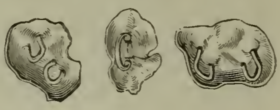
a.



b.



c.



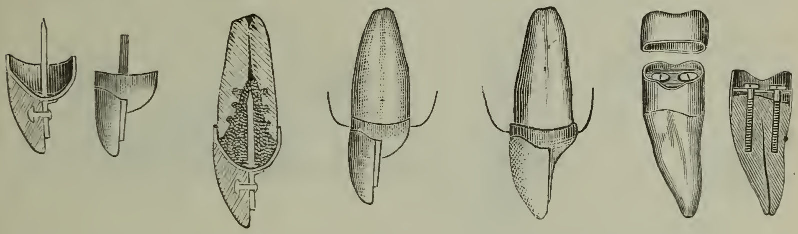
The inventor goes on to say, "Superior bicuspids, when decayed or filled on both approximal surfaces, are very apt to split between the cusps, especially when the cusps are quite long and particularly well defined. . . . Within the past three or four years (1872 or '73) I have repaired such cases by attaching a porcelain cusp to the remaining portion of the crown by means of a platina band, in the manner I will describe. Make a cast of the case; select a small-sized, plain plate tooth (with 'cross-pins' if possible), and grind to fit the cast. Take a strip of platina plate of thickness No. 31, about one-quarter of an inch wide, and of sufficient length. Punch pin-holes in the center, and rivet or solder on the tooth. Bring the two ends together around the model and solder. Fit as nicely as possible, and slip the band over the remaining cusp in the mouth Then fill with oxychloride of zinc. At some subsequent sitting

remove a portion of the oxychloride of zinc, and cap with gold, or any other stopping. Lastly, burnish the edges of the band close to the enamel."

Fig. 31 shows a bicuspid split between the cusps; Fig. 32 a porcelain "plain plate tooth with cross-pins," and Fig. 33 the same cuspid provided with the band soldered to it, and nicely fitted to the remaining part of the natural tooth. Fig. 34 shows the banded porcelain cusp in place on the tooth, and Fig. 35 is a vertical section of the same to show the attaching cement and gold filling of the completed operation. Fig. 36 represents an obvious modification.

In the foregoing figures there have been illustrated such cases as were immediately described, but the language used is broadly inclusive of every form of metallic shell crowns or caps, or sections of such shell crowns or caps provided with retaining devices of any degree of perforation, excision, or projection, as a means of "engrafting the caps" to "the teeth or fragments of teeth prepared to receive them."

FIG. 37. FIG. 38. FIG. 39. Fig. 40. FIG. 41.



A partial or complete porcelain facing of such partial or complete metallic substitutes for lost portions of the natural teeth, or for entirely removed crowns of such teeth, was likewise embraced in the description of Dr. Wood.

In the DENTAL COSMOS for June, 1877, in a report of the March meeting of the Pennsylvania Association of Dental Surgeons, Dr. Essig, of Philadelphia, illustrates his improvement on a method credited to Dr. Bing, of Paris. On page 315 he says, "The case illustrated, *a*, was now restored in wax as in *b*; when, as stated, an impression would be taken, plaster model made, and die and counter-die obtained; a gold cap could now be swaged, and loops soldered to it as represented in *c*. The body of this gold cap is filled with softened Hill's stopping, as well as the remains of the tooth. The cap is placed in position, and with a heated instrument the temperature conveyed through the gold cap to the gutta-percha in both the tooth and cap. The jaws may now be closed while the gutta-percha is soft, and when cooled the excess of Hill's stopping re-

moved, and the edges of the gold burnished down to the tooth."

This is an obvious modification of Dr. Wood's device, made clear by the illustrations; and equally obvious modifications might well be derived from the preceding figures and descriptions.

For example, Fig. 32, backed with platinum or gold plate as usual and soldered to a "little toad-stool," Fig. 18, would appear like Fig. 37, and could similarly be mounted on a root, with the result seen in the sectional view, Fig. 38, and in the perspective view, Fig. 39. In the old and well-known method of soldering a plate tooth (Fig. 32) to a root-plate and post it is usual to contour the backing with solder, and therefore a like contouring would be done by any dentist in the process of mounting such a plate tooth on a "toad-stool," as is illustrated by Fig. 40.

Dr. E. S. Talbot, in the Dental Cosmos for September, 1880, on page 465, describes and illustrates his telescoping cap-crown that fits over a collar in which is soldered a diaphragm perforated for the passage of headed-screw pivots to enter the root through the

Fig. V.

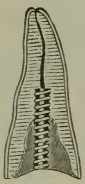


Fig. 42.

Fig. 43.

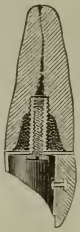


Fig. 44.

inclosed cement. This is a combined cap-crown and cup-crown, Fig. 41.

The dental profession is therefore indebted to the original and first inventors of the devices which may be summarized as follows:

1st. A thin metallic shell-section having the external configuration of the absent part of the defective natural tooth to be restored, and having on its inner surface retaining devices which engage with the plastic "material to be used for engrafting the caps to the natural base."—Dr. B. Wood, 1862.

2d. Such a metallic shell-section faced with porcelain, colored to resemble a natural tooth.—Dr. B. Wood, 1862.

3d. A metallic ferrule or collar surrounding a tooth-neck at or under the gum-margin, and inclosing a fractured tooth-crown or fragment of such crown, and also inclosing a plastic material which serves to retain the ferrule or collar on the natural tooth-neck, and furthermore replaces the absent portions of the natural tooth-crown. —Dr. C. E. Francis, 1857.

4th. A thin metallic ferrule or collar soldered to the platinum pins

of a porcelain imitation of a natural tooth-front, and secured upon a defective natural tooth by a filling material occupying conjointly the ferrule and the parts of the tooth surrounded by the ferrule.—Dr. W. H. Dwinelle, 1855.

5th. A thin metallic ferrule or collar soldered to the platinum pins of a porcelain imitation of a natural tooth-crown front, and secured upon a defective natural tooth by a plastic material occupying conjointly the cavity of the tooth and the cavity of the investing ferrule or collar.—Dr. C. E. Francis, 1872.

6th. A thin metallic shell-section having the external configuration of the defective natural tooth which is to be restored, and provided with a stem, pivot, pin, or post firmly attached to and projecting from the inner surface of the shell, which stem or pivot affords additional security to the engrafting of the shell upon the tooth by means of the inclosed plastic material which also surrounds the stem, pivot, or post.—Dr. Fisk, 1876.

It cannot be termed invention to merely magnify the "platina

Fig. 45.

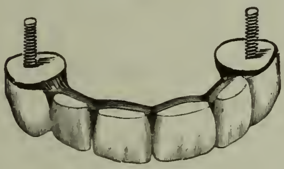
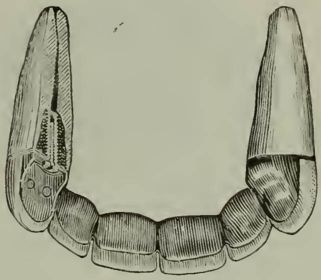


Fig. 46.



scraps" of Dr. Wood into the stems, pivots, pins, or posts of Dr. Fisk, but the descriptive terms "toad-stool" and "umbrella" justify the depictions which emphasize the fact that Dr. Wood actually anticipated some very modern devices claimed as inventions.

7th. A thin metallic ferrule or collar surrounding a tooth-root, at or under the gum-margin, and provided with an integral metallic diaphragm secured to the root by screws, combined with a thin metallic shell which telescopes over the collar, and, like the collar, incloses retaining plastic material.—Dr. E. S. Talbot, 1880.

8th. A thin metallic ferrule or collar surrounding a tooth-root at or under the gum-margin, and provided with an integral metallic diaphragm to cover the end of the tooth-root, and, in connection with the neck-flange of the collar, to inclose with the root-end a suitable cement for fixing the collar hermetically tight upon the root.—Dr. E. S. Talbot, 1880.

In all the cases and instances hitherto described the plastic mate-

rial, in addition to its properties of substitution and retention, also serves to exclude food and fluids and hermetically seal the metallic structures upon their natural bases.

Fig. V reproduces Dr. Dwinelle's cut showing in section a threaded tube fixed in a root by filling material. Fig. 42 is a cup-crown like Fig. P, and Fig. 43 is the same secured by its headed screw on a tubed root like Fig. V, in the manner described by Dr. Dwinelle, who furthermore says, pages 281–282, "After the root is filled with gold as above described and properly finished, an impression is taken of its surface in wax, from which castings are made, and from these plates are swaged. These are adjusted to the roots, and a golden pivot is soldered to each of their upper surfaces. A plate tooth is now skillfully adapted to the fixture, when it is ready for use. In this manner a plate may be extended across an intervening space, and an unbroken row of teeth mounted upon it."

Fig. 44 shows the model of a mouth from which the superior centrals and laterals had been extracted. The roots of the cuspids are represented as screw-tubed, filled flush and finished as directed by Dr. Dwinelle, and shown in his Fig. V. Cup-crowns like his Fig. P, cut away as seen in Fig. 42, are then fitted to the cuspid root-ends. A bridge across the intervening space, and an unbroken row of teeth mounted upon it, is shown detached in Fig. 45, and in position on the exposed roots in Fig. 46; the left cuspid root and its crown appearing in section to exhibit the screw attachment, while the right cuspid root and crown are shown as they might be seen after packing the crystal gold into the cup, and giving all the gold work a smooth, rounded finish.

Fig. 47.

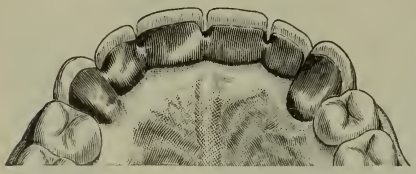


Fig. 47 shows the completed cup-crown bridge made as described by Dr. Dwinelle more than thirty years ago.

MOVING INDIVIDUAL TEETH.

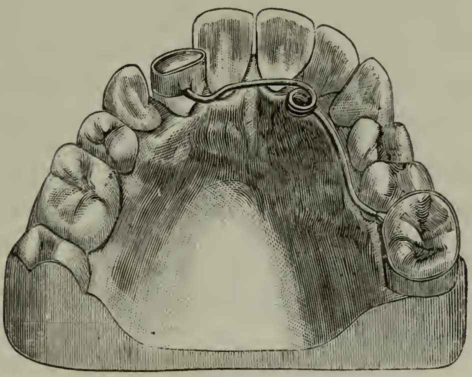
BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

To force out central and lateral incisors, I have found the following methods useful: Around the tooth to be moved, and around the molars as nearly opposite the direction the incisor is to travel as possible, fit platinum collars. Solder cups upon the collars directly opposite and in line. Make a spring of piano-wire (Fig. 1), and spring it into the cups soldered upon the collars. Fig. 2 shows the appliance in place.

Another method is to make a plate to fit the teeth, thickening it

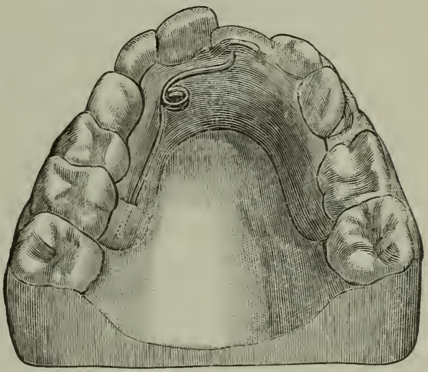
Fig. 1.

Fig. 2.



nearly to the cutting edge of the tooth to be moved, and drilling a hole through the thickened part. Directly opposite, at some convenient point on the back part of the plate, drill another hole just deep enough to hold the spring, and put the spring in place (Fig. 3). If the hole in the thickened part is drilled in the proper place, the end of the spring will hit the tooth midway between its cutting edge and the margin of the gum. This spring is very effective. The pressure is constant, and it is readily removed for adjustment or for any other purpose.

Fig. 3.



PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting, Tuesday evening, March 9, 1886, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. E. A. Bogue, in the chair.

The President. Gentlemen, we have with us this evening Professor Doremus. His time being somewhat limited, we will dispense

with the reading of the minutes and ask him to favor us with the remarks he has to make upon the subject of

Cocaïne.

Prof. R. Ogden Doremus. Mr. President and Gentlemen: Allow me first to thank you for the very cordial invitation to appear before you and speak upon the subject of cocaïne. I am hardly in condition to appear here to-night, having spent six hours at the colleges with which I am connected examining the unfledged sawbones; and I am sorry to say that when I leave your presence I have about two hundred pages of written responses to examine and correct. It is a very busy week, and I ought not to appear here to discuss this question without having looked over some of the more recent statements concerning it.

My attention was called to this subject while president of the Medico-Legal Society, by a letter from a graduate of Bellevue living in the West, giving a description of a case of what he suspected to be fatal poisoning by cocaïne. I will relate the facts of that case, and then give you a little *résumé* of some investigations that I have been able to make regarding the administration of this substance, merely for the purpose of sounding an alarm. I am sorry to say that I have made no experiments with cocaïne except such as a chemist would make. I have made no physiological experiments, and no doubt you have had more experience than any other class of men in the administration of this poisonous agent. I wish to call your attention to a chart which was made many years ago by a distinguished physician, it being as complete a list as it was possible to obtain of all the symptoms of poisoning by arsenic, eighty-five cases being tabulated. I do not propose to burden you with the details, but merely to ask you to notice the two prominent symptoms of arsenical poisoning. If there is anything which toxicologists and medical men think they know it is the effects of arsenic, whether taken through the mouth or in any other way. One of those effects is vomiting, and another is diarrhea; but if you will look at these cases you will see that there are quite a number where vomiting was absent entirely, and in other cases diarrhea was wanting. In fact, I have had cases of arsenic poisoning where it simulated the effects produced by morphine, and other cases where it simulated the effects produced by strychnine. Therefore, judging from those poisons that we are familiar with, we never can expect to have all the symptoms in any two or three cases entirely agree. That is one of the great difficulties in toxicological cases. Medical men testify to such a variety of symptoms that unless the person who has died reveals not only through the examination of the vis-

cera the poison, but has also every symptom that has ever been recorded, it is almost impossible to get a jury of twelve men to agree that the person has been poisoned. So it will be very difficult for medical men, or yourselves, to agree when we take up this subject of cocaïne.

Dr. F. M. Thomas, of Leonardville, Oneida county, Kansas, who was graduated at Bellevue College sixteen years ago, writes me that in October last he was called to see a Mrs. Castor, and found her unconscious; breathing heavily and irregularly; pulse very low; left pupil largely dilated, and face spasmodically drawn up towards the dilated eye. There was a spasmodic action of the left arm and upper part of the body at regular intervals, during which she clutched the bed-clothes and twice succeeded in vomiting. Salivation was excessive, and the heart seemed almost exhausted. Dr. Thomas remained with her several hours until she died. He ascertained that she had been using a solution of cocaïne for toothache, and sent me the vial containing the unused cocaïne for examination. I found the contents to be a four per cent. solution, and seeing the importance of securing all possible testimony relating to the case, wrote Dr. Thomas to make, if possible, an autopsy of the remains; but the family friends would not consent, and the only additional information that Dr. Thomas was able to furnish was the fact that the upper molars in which the cocaïne had been used were on the left side,—the side, you will remember, which had the largely dilated pupil and spasmodic action of the facial muscles.

After this correspondence I brought the matter before the Medico-Legal Society, and asked if any of the members had had experience in the administration of cocaïne, and what were its effects. In reply Dr. H. J. Boldt, of this city, gave me the results of his experience with the drug when administered to patients and of his experiments with it upon animals. Cocaïne administered to a dog caused profuse salivation, while with the cat salivation was not as marked, but the animal died in twelve minutes. Dr. Boldt injected 15 minims of the four per cent. solution for a patient who was suffering with severe occipital neuralgia, and almost immediately she began breathing rapidly; her countenance flushed, the pulse rate increased, and then came pain in the cardiac region, dyspnœa, dizziness, and in two or three minutes the patient fell off the chair unconscious. The breathing then stopped entirely, and artificial respiration and electricity were resorted to, the former being kept up for half an hour until respiration of a very uncertain sort began. It was over an hour before the patient was able to leave the office, walking then much like an intoxicated person, and when she reached

home she vomited, although that may have been caused by the stimulants given her. Dr. Boldt had other cases where the same phenomena were observed, though in a less violent form,—the patients recovering without artificial respiration or electricity being used,—and he has injected as high as 20 minims of the four per cent. solution without any bad effect being produced; but he looks upon the drug as a poison which is to be used only with great care. There is little doubt but the first patient reported by Dr. Boldt would have died if she had not been skillfully cared for and artificial respiration and electricity used.

I have also received a communication from Dr. Edward Bradley, of this city, concerning a gentleman who had partial paralysis of the muscles of one side of the face and neck a few hours after cocaïne was applied to the cavity of a tooth, but as I understand that patient is present this evening it will be best to allow him to tell his own story.

I have had conversations with quite a number of medical gentlemen who have expressed great surprise that I should call cocaïne a poisonous substance. Have you looked at the formula of cocaïne? It is composed of carbon, hydrogen, nitrogen, and oxygen, in proportions very closely resembling morphine and other poisons. All these alkaloidal bodies are compounds of three gases and one solid. No human being can explain how these elements—which of themselves are perfectly harmless—should be so effective when combined. What a mystery of mysteries is chemistry! A most intelligent gentleman, who called our attention to this very thing, said to me, "It is not a poison; I have known persons who took hypodermic injections of it." But so they do of morphine!

Gentlemen, my object has been to sound the trumpet of caution, and not of alarm. As I understand it, anybody can purchase cocaïne from any druggist, and use it at pleasure, and there is no law which obliges druggists to label it as poison. This is not as it should be, for the history of the results of the drug prove it to be in the unskilled hand a dangerous remedy. I think chemistry is going to be able to detect this poison when it has been introduced into the system. If an autopsy had been made of the remains of Mrs. Castor, of Kansas, the evidence of cocaïne might have been discovered. It is only recently that we have been able to find evidence of the presence of strychnine and morphine in the body. I had one case of strychnine poisoning where the person had been dead three months, and, notwithstanding the considerable progress of decay, I found strychnine present, and was able to show the crystals in court. Some processes have recently been devised by means of which we can separate a vast number of these alkaloids. I have not read of any case of cocaïne poisoning being so detected, but I have no doubt it can be.

The President. The society owes its thanks to Prof. Doremus for the facts he has given us this evening, and for stating them in so interesting a manner. May we have the pleasure of hearing from Dr. Hoyt his own experience in the case which Prof. Doremus has spoken of?

Dr. E. F. Hoyt. On the 13th of December, 1884, I consulted my dentist—who, by the way, I do not wish to censure in any way—in regard to several teeth which I knew to be imperfect. One of them, a right lower incisor, was decayed below the gum and was exceedingly sensitive to the ordinary process of excavating; in fact, excavation was almost unbearable. Some cotton was saturated with the four per cent. solution of cocaïne and allowed to remain in the cavity a few moments, when I imagined the tooth was less sensitive. The excavation was then continued, and when the pain became too severe more cocaïne was applied. These applications were made five or six times during the two hours' operation, after which the cavity was filled with gold; but, on account of the slight anchorages obtained, the filling came out during the polishing process. The act of filling did not cause any pain. The cavity was then carefully filled with a preparation of chloride of zinc, and the tooth now remains perfectly free from all sensation. Forty-eight hours after the operation, while at breakfast, in attempting to swallow some coffee, it escaped from out the right side of the mouth, and I found that I had absolute paralysis of the muscles adjacent to the tooth that was affected. I had no means of discovering the paralysis except by trying to employ the function, and it might have been slowly and gradually developing from the time of the application of the cocaïne. The extent of the paralysis at the time I discovered it must have taken as much as forty-eight hours to develop, judging from the rapidity of its subsequent advancement. During the next two days the paralysis extended from its original location, and involved the whole right side of the head; I could not move the motor muscles, and my right eye was wide open and I could not close it. That condition lasted for ten days. I had at times a slight indication of it in the right arm, but perhaps that was imaginary.

I commenced to use a continuous current of electricity through the affected parts, and continued it for ten days, during which time I could not detect a particle of change. At the end of ten days I noticed a very slight relaxation at the point where the paralysis first showed itself. It gradually improved for six or seven weeks, at the end of which time the action of the muscles was perfectly restored; but for over a year that side of the face continued to be particularly sensitive to changes of temperature. I consider myself

fortunately free from the unpleasant experience. The cerebral condition for three or four months after the operation was something similar to what would result from a person taking an overdose of morphine. For several weeks the brain was intensely sensitive, so that after reading a little I would become so depressed that I would have to lie down. I could not read a column in a newspaper, nor keep up a continuity of thought. That difficulty gradually disappeared, of course, as the other symptoms did.

Now, as to the cause of this trouble, whether it resulted from cocaïne or not is a matter of speculation. My individual explanation of the matter is that the cocaïne excited, by its irritating effects perhaps, a sub-acute inflammation of the nerve-tissue at the point of application, which involved the whole family of nerves in that side of the head, and that the paralysis was due to inflammation resulting from the dental operation, and not to any specific action of the cocaïne itself. I think I have given you as perfect a *résumé* of my experience in this matter as I possibly can.

Dr. Kingsley. There has been one point omitted in the description of this case,—a point that may be of more interest to us as dentists than almost any other one. We should like to know whether the pulp in that tooth was living, and, if so, whether it was exposed? Can the doctor give us any positive information upon that point?

Dr. Hoyt. My understanding at the time was that the excavation extended nearly to the surface of the pulp, and that the cocaïne was applied almost in actual contact with the nerve-tissue. I think the effect of cocaïne is a specific one, by mechanical contact.

The President. Did your dentist use the dam?

Dr. Hoyt. The dam was not used during the process of excavation, nor during the time the cocaïne was applied. After that the dam was applied, and was on during the process of filling.

The President. Is not Dr. Kingsley's question answered, in view of the sensitiveness of the tooth during excavation?

Dr. Hoyt. I never before had a tooth filled that was very sensitive. That one was particularly so.

Dr. Kingsley. The statement that has been made is exceedingly important. If the pulp was exposed (which I am a little loth to believe), and the cocaïne was applied to the surface of that exposed pulp, a gold filling inserted, and that filling replaced with something else, I think we, as dentists, would say there was sufficient justification for the belief that paralysis might result from the operation irrespective of the application of cocaïne. The important question is, Was the pulp exposed, or was it not?

Dr. Lord. Was the tooth sore in the socket after the operation?

Dr. Hoyt. The tooth has been perfectly free from sensitiveness since that time. I do not think the pulp was exposed. My understanding was that the excavation was continued nearly to the pulp, sufficient to get saturation and specific action of the cocaïne by contact.

Dr. Woodward. I would like to ask Prof. Doremus whether there is any antidote known for poisoning by cocaïne?

Prof. Doremus. I do not know that there is, except as we would make an antidote for morphine,—stimuli. I think Dr. Hoyt has had an administration of that in electricity and nerve tonics.

Dr. Hoyt. The only medicine I used was the tincture of nux-vomica, five or six drops three or four times a day.

Dr. Kingsley. I may say that Dr. Hoyt showed himself to me within a few hours after he discovered this paralysis, and I saw him from time to time for several weeks thereafter, and can assure you his statement is not exaggerated. As to his mental condition, I cannot speak with certainty, but know that he was complaining of trouble with his head, and that he could not attend to business.

Dr. E. H. Raymond. My knowledge of cocaïne consists of the observations I have made in using it. I have read in the newspapers of one or two cases in which it was alleged to have had a very injurious effect constitutionally; and I have heard of one case of death, which Professor Doremus has related to you to-night. Inasmuch as I have never known any serious injury to result from the use of cocaïne, I feel friendly towards it; am not afraid of it personally, nor am I afraid to use it; but I always believe in being cautious and conservative. About one-third of the contents of the bottle that was sent to Prof. Doremus had been used. From this newspaper report you would get the idea that one application in the tooth caused death. I do not believe the professor thinks so small an amount would cause so serious a result.

The President. Dr. Raymond is prepared to make some further observations upon this subject, and we shall be pleased to hear from him now.

[At this point Dr. E. H. Raymond, of New York, read a paper entitled "Cocaïne," which for want of space we are compelled to omit.—Ed. Dental Cosmos.]

Dr. J. W. Clowes. I am glad to see this cocaïne excitement coming to an end. When gentlemen appeared here some months ago with headaches, inflamed faces, and other abnormal conditions, induced by injections of cocaïne, I was sure a professional *craze* was in pro-

gress. It is pleasant now to believe that, having reached its height, more sensible views will henceforth prevail. I have used cocaïne, and found it of little value in its effect upon sensitive dentine. It is practically useless in dental offices, and its absence need not be a matter for regret. But we *have* something that will not disappoint us,—something that we know all about,—which, in *minimum quantity*, will go a long way to serve us and work our wills. I have had occasion, in this connection, to mention it before, but you have probably not tried it because I told you to. It was too simple and easy to be seriously considered. Nevertheless, I tell you again to saturate cotton—the size of a large pea—with *chloroform*. Let some be inhaled, some swallowed with the saliva, and the cotton itself applied to the cavity. Then proceed with your excavation. You may repeat the chloroform, if you like, *but only once*. The magical effect will soon show itself, without any appearance of anesthesia in the patient. So eminently satisfactory will be the result that a mutual gladness will prevail.

While speaking I wish to remind you of another good thing that perversity may have caused you to reject. I believe in devitalizing dental pulps with arsenic, and think it beneficent. Some of you will not believe in this practice, because, when you try to kill—the pulp will not die. You adhere to the original prescription, as given by Spooner, and—fail, of course. The improved version is *creasote and arsenic*, without the morphia. Make a pocket for them in the tooth. Apply in small amounts; pack cotton closely over it, and a *dead shot* will surely follow. Intelligent gentlemen have grand conceptions regarding steel screws as aids in building up old shells and roots of teeth into "glorious crowns," and, all unmindful that *rust corrupts*, while yet they boast down come the structures they have reared in vain! Hardened platinum is their stronghold of reliance, and when I tell them this they should believe.

Dr. Weld. I have had considerable experience in the use of cocaïne, and perhaps my testimony will be of interest to the members of this society. In the first place, I desire to thank Professor Doremus for the cautionary signal which he has displayed, and for the desire manifested to guard against any possible injury from the use of this new product; but in doing so I must say a word in *favor* of cocaïne. If I were to criticise the remarks that we have heard this evening, it would be that they emanate from the stand-point of theory, and are theoretical rather than practical. The professor finds one isolated case in Kansas; then refers to a patient in New York, a physician who has suffered from cocaïne poisoning, and this physician apparently denies all that the professor has said, for he thinks his trouble did not come directly from the effects of the

cocaïne, but was probably due to something else. Now, suppose it to be true that there are one or two cases of reported injury from the use of cocaïne. It must nevertheless be acknowledged that these reports are in striking contrast to the clinical observations of hundreds of the best physicians and surgeons in the United States who have used this drug without injury for months. It is a most singular commentary upon their intelligence to find, after so long a time, that cocaïne is a poison. It has been stated by the speaker who preceded me that cocaïne is of no earthly use in a dental office. I have to say that it has one practical use there, and that is in taking impressions. You all know that the taking of impressions is sometimes attended with the most profound distress to the patient and inconvenience to the operator; the patient gags, and it is sometimes impossible to take the impression. By using cocaïne in the form of a spray, thrown from a common hand-atomizer upon the walls of the pharynx, that difficulty is completely overcome, and in five minutes the impression can be taken without trouble. There is another use for it. Laryngologists have occasion to explore the throat very frequently, and they use cocaïne with great success where there is this *reflex trouble* and *hyperesthesia of the parts* to which I have alluded.

Dr. Kingsley. In my opinion there is something infinitely better than cocaïne to assist us in taking impressions. I have tried it for thirty-six years. It is skill. Cultivate that and you do not need any cocaïne; nor do you have to wait five minutes for the patient to get ready for the operation. I am constantly taking impressions of cleft-palate cases without any previous treatment, and not one in a hundred of those or any other cases develops a retching or other trouble during the operation, and I attribute it to my lack of skill when they do. My experience with cocaïne for any purpose does not encourage my making further trials.

Dr. J. Morgan Howe. Cocaïne has such wonderful properties when applied to soft tissues, especially to mucous surfaces, that its sphere of usefulness in dental practice should not be overlooked, although it has disappointed our hopes that it would produce anesthesia of dentine when applied to it. In the fall of 1884 I made a report to the profession on some of the first, if not *the* first, experiments that were made by myself and a few friends—Drs. Perry, Payne, and Ives—in regard to the local effects of cocaïne on the dental tissues. The same uncertainty and unreliability that appeared in those few reported cases has followed the history of its application to dentine ever since, the expected effects being so seldom apparent that it is not worth while to use it. I am gratified that Dr. Raymond has reached the conclusion he has with regard to the hypo-

dermic use of the drug; not because it is unreliable, but because I object on principle—and did so at the time he began using it—to the introduction of any drug into the circulation for so insignificant a purpose as the reduction of the sensitiveness of dentine. In saying that, I do not by any means overlook the great desirability of being able to reduce the sensitiveness of dentine; but when we consider the idiosyncrasies of patients as shown in the administration of almost all poisonous drugs, the risk is not at all worth taking. I think, however, there is a use for cocaïne in the dental office. In cleaning the roots of teeth the use of cocaïne solution, where the operation is too painful to be borne, is perfectly legitimate. In the opening of abscesses and the probing of sinuses it has often been of great service to me, and in one case it was very useful in taking an impression, notwithstanding the danger I am in of being called unskillful by Dr. Kingsley. Last week a gentleman desired a full upper denture, whose disposition to nausea and vomiting, on the contact of anything foreign with the palatine arch, was very great. He had several sets of teeth which were unsatisfactory, and it seemed as if this local and reflex excitability had been the cause of the previous lack of success; for he said there had been nine impressions taken for the last set that was made, and now I could hardly touch the roof of his mouth with my finger without producing violent nausea. The whole difficulty was overcome by lightly moistening the hard palate, and as much of the soft palate as I could touch by the most gentle manipulation, with a solution of hydrochlorate of cocaïne, applied with a wad of bibulous paper held in a pair of Dr. Bogue's tape-forceps. The application was made twice, with an interval of two or three minutes, and a plaster impression was then taken without any difficulty whatever, although it happened that, through an error, the plaster used set very slowly. The result was very satisfactory both to the patient and myself.

Dr. Raymond. I am very glad that Professor Doremus has given us this testimony this evening concerning cocaïne. I do not wish to defend the agent as such, and experimented with it simply to find, if possible, an agent that we could use for the benefit of our patients. Aside from its systemic effects, one of the most serious objections to its use hypodermically is the mechanical irritation produced by the needle-point, which I consider quite as serious as the cocaïne itself, especially in certain cases of constitutionally delicate women, and such persons as are affected by any slight displacement of the tissues.

The President. Will Dr. Hoyt tell us whether in his opinion cocaïne acts from the periphery inward, or from the center toward the periphery?

Dr. Hoyt. I did not direct my observations to the anesthesia, but simply to the local irritation, which extended through all that family of nerves by subacute inflammation. I should say that the constitutional action would be upon the nervous centers, as in other poisons, and the local action upon the sensory nerves by actual contact, as in the spraying of ether.

The President. We owe our thanks to Dr. Hoyt for his kindness in meeting with us this evening and making the statement he has. We beg that he will often favor us with his presence at our meetings. We will now recur to

Incidents of Office Practice.

Dr. C. D. Cook. I took an impression of a lady's mouth three or four weeks ago, and you will see by this model that she has six perfect bicuspids in the upper jaw.

Dr. J. S. Latimer. In reading the report of Dr. Brockway's paper on "The Rubber Dam," and the remarks thereon, I did not notice anything concerning a method which, though not original with me, I have employed for ten years or more. The essayist spoke of applying the dam to the lower third molar, and including every tooth around to the incisors, so as to have free access to the cavity and get the rubber out of the way. I have no assistant, and the method I use enables me to dispense with one. The piece of rubber is selected, and the holes punched as usual. The jaws of a suitable clamp are passed through the hole made for the third molar; after which weights are attached to the lower corners, and the buckles of the strap to the upper corners of the rubber. The clamp-forceps are then applied to the clamp, and the rubber drawn closely around the handles to enable the operator to see at least one side of the tooth. The clamp is then carefully adjusted to the tooth, and the strap brought back over the head; then, the rubber being well out of the way, with the index or middle fingers of both hands, it is brought under the jaws of the clamp and forward over he teeth in the usual manner.

The President. We have before us this evening a set of models and a very short paper from Dr. J. M. Brigiotti, formerly of New York, and now of Paris, which the secretary will please read.

Communication from Dr. J. M. Brigiotti, of Paris.

Mr. President and Honored Colleagues: Allow me to take advantage of this occasion to present the case of a lady, fifty-two years of age, for whom I undertook to restore the upper and lower anterior teeth. The accompanying plates will be sufficient explanation.

Fig. 1 is a front view of the mouth as it appeared before anything was done.

Fig. 1.

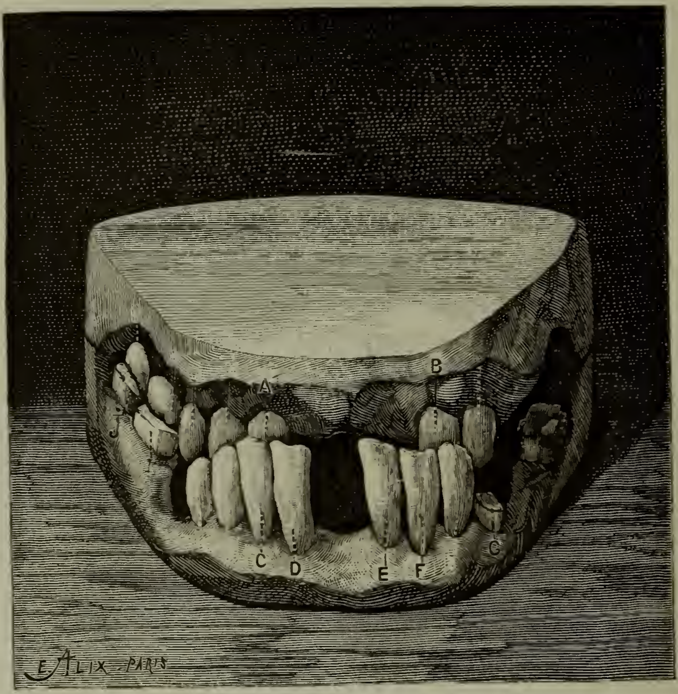


Fig. 2.

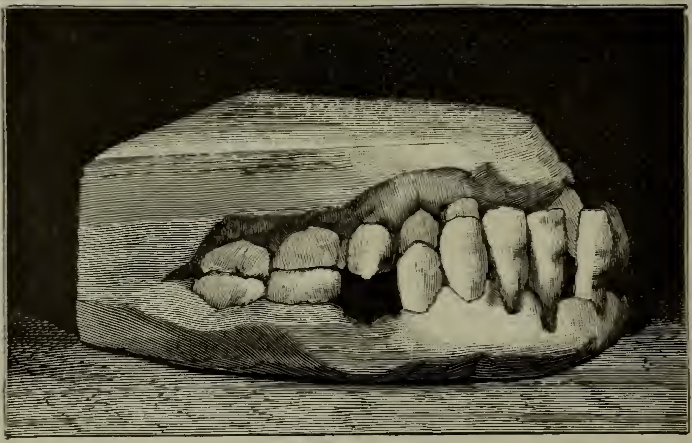
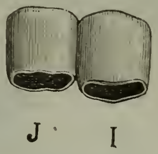


Fig. 2 shows the same conditions in profile.

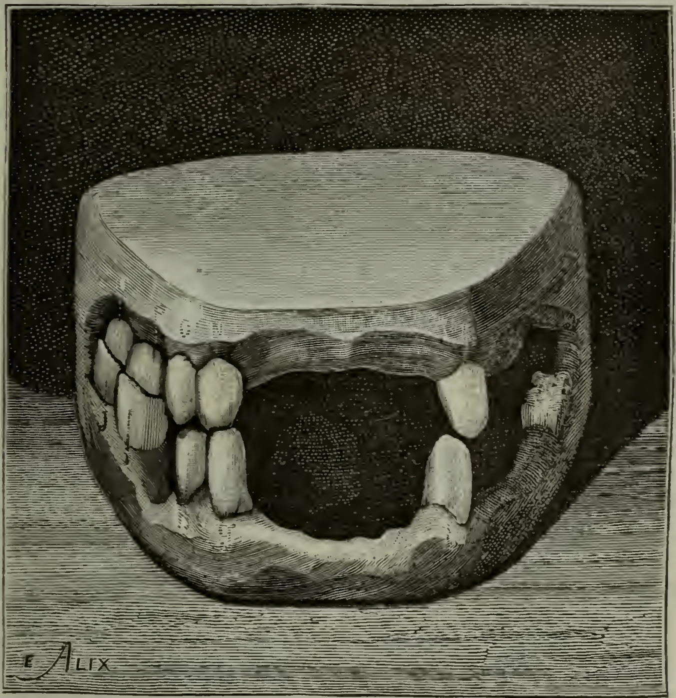
It was necessary first to open the articulation and then make the upper teeth come forward. In order to open the articulation I took advantage of the fact that the molars marked in Fig. 1 by the letters I and J were decayed. They were filled with Hill's stopping, in

Fig. 3.



such manner that the filling overflowed the cavity sufficiently to open the articulation as much as was necessary. This trial assured me that the mouth accommodated itself readily to this new condition

Fig. 4.



of things, and that the filled teeth did not become sensitive under the constant efforts of the new method of mastication.

Gold caps (Fig. 3), were then placed upon the same molars covering them entirely.

From that time on the regulation progressed rapidly, and in less

FIG. 5.

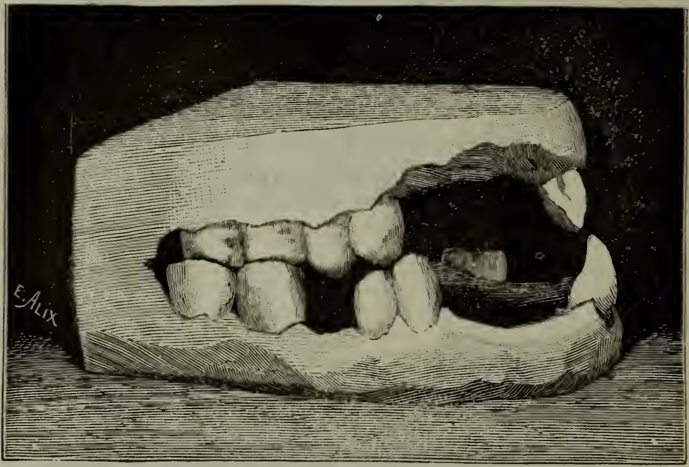
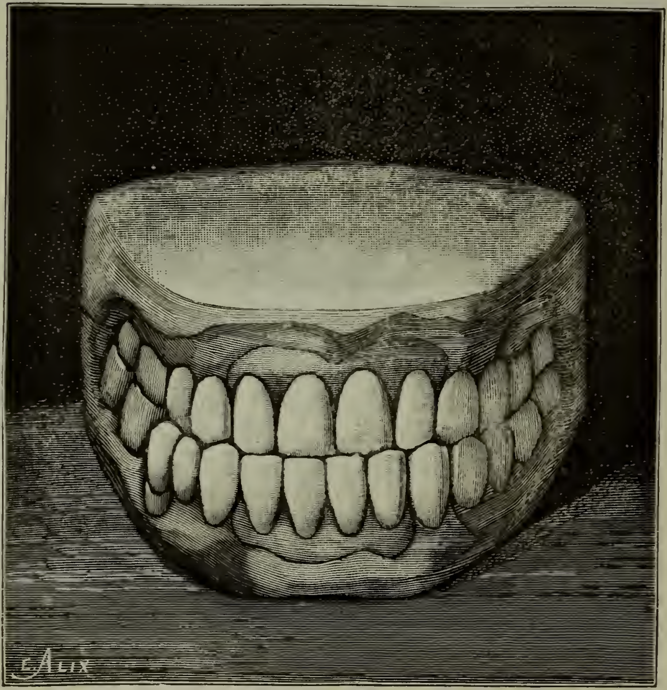


FIG. 6.



than a month it gave perfect results. The next step was to extract

the denuded teeth designated in Fig. 1 by the letters A, B, C, D, E, F, G, and the jaws appeared as in Fig. 4.

Fig. 5 is a profile view of the same conditions.

In two months after the first impression was taken the plates were adapted.

Fig. 6 shows the case finished with the plates in the mouth.

Such is the result. It is useless to expatiate upon it. In conclusion, I should like to add that, if I was anxious to present this case to my colleagues, it was because, the patient being no longer young, I have been able without wearying her and with very little delay to open the mouth, change the position of the teeth, make her accustom herself to new habits in mastication, and finally to adapt good dentures.

These explanations will doubtless be sufficient for my colleagues to appreciate the importance of the work which I have been able to bring to such a successful termination. But I shall be very grateful for any observations which may arise upon this subject.

On motion of Dr. Payne, a vote of thanks to Dr. Brigiotti for his paper was passed.

Adjourned. S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

[Seventeenth Anniversary, December 9, 1885.]

(Continued from page 320.)

President Carr introduced Professor R. R. Andrews, of Cambridge, Mass.

Dr. Andrews exhibited a number of stereopticon views of the development of the tissues of the teeth, and spoke as follows:

Gentlemen of the First District Dental Society: The invitation of your committee came to me in the midst of a very busy professional season. I fear that I have not had sufficient unoccupied time to do justice to your confidence. But the subject of the evening, "The Development of Teeth," is of such importance that I could not deny myself the pleasure of being with you, and I very cheerfully offer the results of my study.

Having become personally interested in photography, I have been enabled to prepare specimens of my collection illustrating this subject; and from the negatives of these photographs I have produced the lantern slides which are to be exhibited to you this evening. They do *not* show the details of a careful drawing; they *do* show

the condition of the tissue as the microscope reveals it to us. I trust the demonstration which I am to give may make the discussion which is to follow more tangible to those of us who are not already familiar with the various stages of growth in a developing tooth.

At so early a period as the second and third month human embryos are rarely available for histological work; they seldom come to me in a perfect condition. I have, therefore, prepared my specimens from fresh embryos of pigs, in which the processes of development are nearly identical with those of the human embryo.

The tissues from which a tooth is derived originate in two of the three germinal layers. From the epiblast we have the epithelium; from the mesioblast the embryonic connective-tissue. In Plate I, Nos. 1 and 2, we see a mass of epithelial cells covering the embryonic connective-tissue. The darker line in the central portion of the picture, appearing to separate the two tissues, really belongs to the epithelium, and is its lowest and most important layer. From it come the first indications of tooth-growth. It has been called the mother layer; it is the stratum Malpighii. The cells of this layer are usually described as columnar or prismatic; at this early stage they are only approximately so. They vary from the spherical to the ovoid, and it is difficult to find the perfect columns shown in some illustrations. Another tissue has been spoken of as being very important during the early stages of development,—the basement membrane. I have never been able to demonstrate the presence of this tissue at this time, nor do I believe it has any influence whatever in the formation of a tooth.

Over that portion of the jaw corresponding to what will be the alveolar border, just prior to the appearance of the anterior enamel-organs, we shall find that the cells of the epithelium have multiplied and are heaped up, forming what is known as the dental ridge of the authorities. The new cells seem to have their origin from the cells of the stratum Malpighii, and not from the central or cuboidal layer of cells. I think this is proved by the intensity of the stain taken up by the cells nearest the Malpighian layer, and by their being of a form nearer the simple bioplast. These are both evidences of new growth. The rapid increase of cells at this point has apparently forced the stratum Malpighii inwards, something like the letter V when the tissue is seen in section. This V-shaped groove [Plate I, No. 3] has been called, and by some recent writers, the primitive dental groove, but in the sense which they would convey it does not exist. Their error shows them to be students of a by-gone literature, and not searchers after actual truth from the living tissues. This folding in of the Malpighian layer extends but part way around the alveolar border. It is much more marked in the anterior portions

of the jaw. The large increase of epithelial tissue at this point [Plate I, No. 8] has not been clearly accounted for, nor have the different foldings of the Malpighian layer. Many writers give these folds a significance which, as yet, I do not recognize. Those of us who have cut many sections from this tissue know that the enamel-organs of the temporary molars are formed where there is an almost *entire absence of either fold, groove, or ridge* [Plate III, No. 36]. May not the condition of the tissue at this time, during its very rapid growth, account for it. The expansion by growth of the surrounding tissue takes it all up, smoothing it all out.

The crimpled petals in their prisoned bud,
In time unfolding, form the perfect flower.

There are many folds at the base of the dentine-germ, just after calcification has commenced, which as yet have not been accounted for. I think they have only the significance of existence. [Plate III, No. 32].

Let us now pass to a consideration of the illustrations showing the various stages from the first appearance of tooth-formation to the perfected organ.

Plate I.

No. 1. Tissue from which tooth-structure is developed. The lower epithelial cells, shown by the dark central line, form the Malpighian layer, and separate the epithelial from the embryonic tissue below.

No. 2. An enlarged view of the same structure, with the Malpighian layer perpendicular.

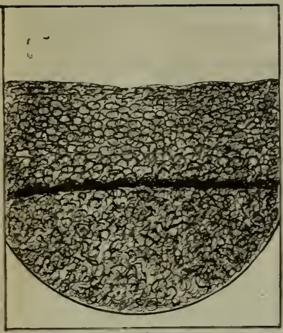
No. 3. Section of lower jaw, showing the first stage in the development of the enamel-organ. The dental groove is here seen with the enamel-organ budding from the right of it. The Malpighian layer at the right is not covered with its epithelial layer, it having been removed by the action of the knife in cutting the section. In this picture there is as yet no appearance of any formation of bone.

No. 4 shows the enamel-organ a little further developed, the epithelial covering being almost intact. Below the organ we see the first indications of the formation of the jawbone.

No. 5. The enamel-organ still further advanced in its growth by a multiplication of cells at the base of the organ.

No. 6. shows still further progress in the growth of the enamel-organ, the cells in its central portion having enlarged, causing it to assume a flask shape. The action of the knife has separated it somewhat from the tissue beneath, which shows beautifully the zone of embryonic tissue from which is to be developed the dentine-germ. [To place this view in the correct position, turn the top to the right.]

PLATE I.



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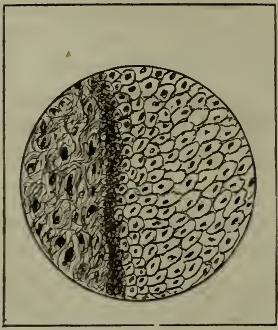

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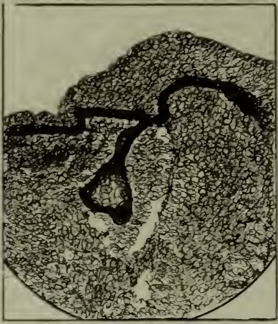

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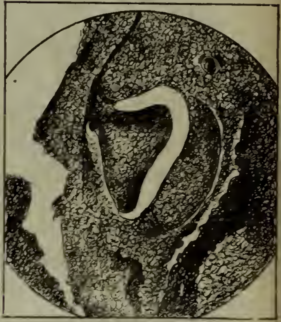

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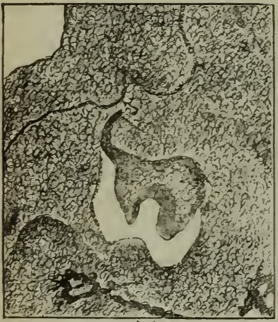

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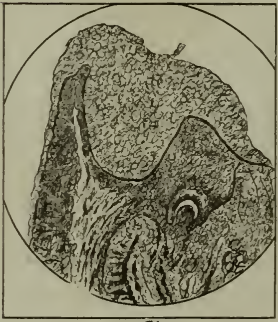

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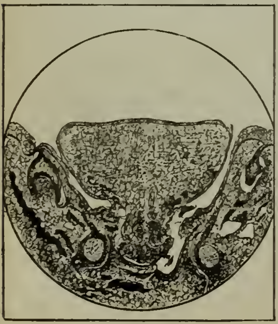

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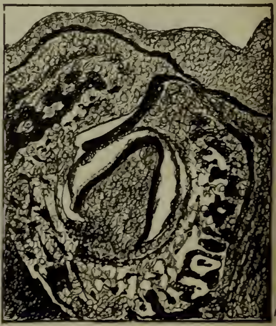

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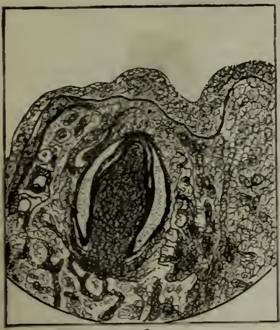
Plate II.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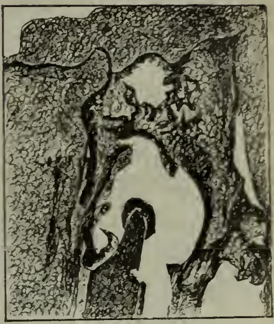
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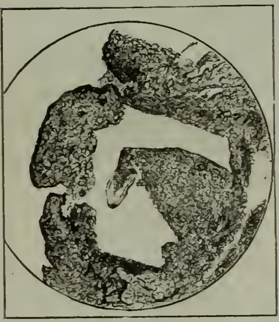
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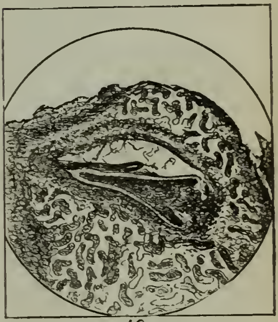
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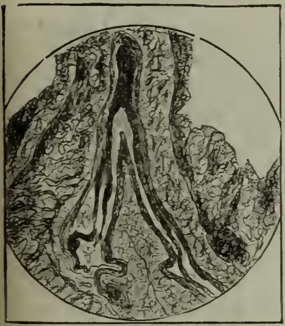
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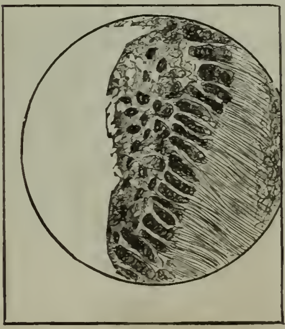
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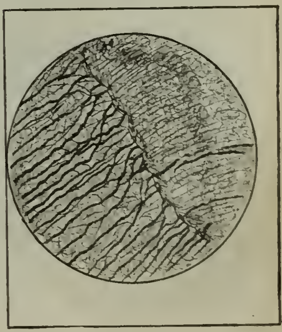
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No. 7. The knife has here caused a separation of the dental tissues. The dentine-germ is here shown in the form of a papilla pushing up into the enamel-organ.

No. 8. Small view of the same, a little farther advanced, but from the embryo of a sheep.

No. 9.* Section of the lower jaw, showing a larger growth of the dentine-germ, capped by the enamel-organ, with part of the tongue at the upper right corner; the dark line at the left of the enamel-organ being the developing jaw.

No. 10.† Cross-section of the lower jaw and tongue, showing tooth-development in the second stage at the right, and in the third stage at the left.

No. 11. Enamel-organ and dentine-germ of a bicuspid or molar.

No. 12. Dentine germ, nearly surrounded by the enamel-organ, and entirely surrounded by the walls of the sacculus. On the left is seen a budding off from the enamel-organ. This is the germ of the enamel-organ of the corresponding permanent tooth. The walls of the sacculus are very finely shown in this section, and around this is seen the developing bone.

Plate II.

No. 13. Similar to the preceding, but farther developed. Calcification has commenced on the apex of the dentine-germ.

No. 14.‡ Developing molar of kitten with commencing calcification.

No. 15. Here we have the breaking up into epithelial clusters of the cord which connects the enamel organ with the Malpighian layer. On the left is the permanent enamel-organ. The apex of the dentine-germ is covered with a cluster of enamel-cells, only a portion of the enamel-organ being present.

No. 16.§ Section of rabbit's jaw, showing the temporary tooth, with the germ of the permanent tooth just beneath.

No. 17. Section of human jaw, showing calcification of the apex of the dentine-germ, all epithelial tissue having been washed away except the Malpighian layer.

No. 18. Section of growing tooth, with tissues teased out to show a fold of calco-globin between the calcified dentine and the layer of ameloblasts or enamel-forming cells. [To place this view in the correct position, turn the top to the right.]

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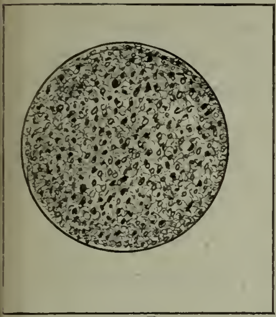
* Section by Dr. Sudduth.

† Section by Dr. Sudduth.

‡ Section by Mrs. E. N. Whitman.

§ Section by Dr. Sudduth.

PLATE III.



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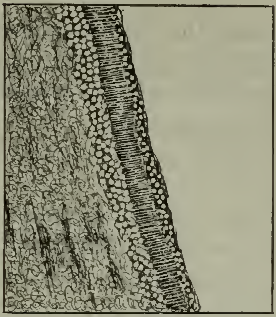

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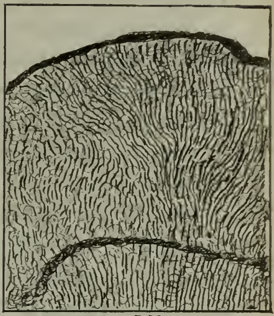

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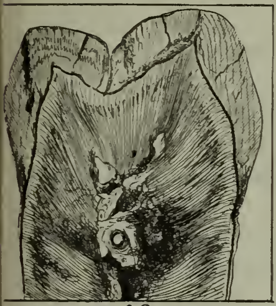

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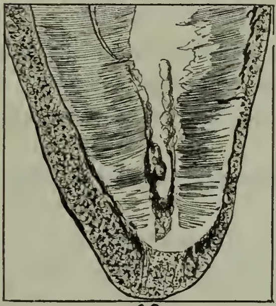

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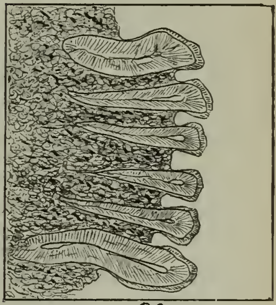

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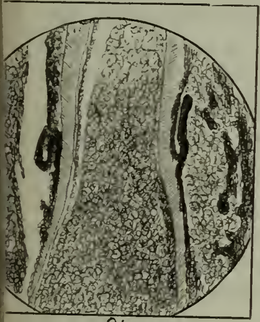

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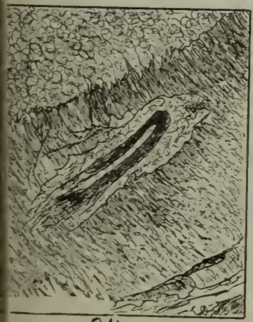

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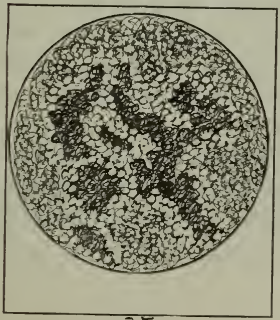

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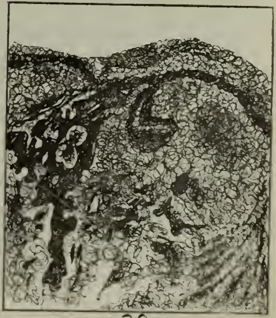

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No. 19. Section of growing tooth, showing folds at the base of the dentine-germ.

No. 20. Section of growing tooth with folds at the base of the dentine-germ, and folds of the calco-globin layer seen as a fine, dark line near the base of the dentine-germ, extending from the enamel which caps the apex of the germ.

No. 21. Greatly enlarged view of the odontoblasts or dentine-forming cells.

No. 22. Another view of dentine-forming cells.

No. 23. Another view of odontoblasts.

No. 24. Section of normal dentine and enamel, showing beautifully the termination of the tubuli at the junction.

Plate III.

No. 25. Cross-section of the tubuli of the dentine.

No. 26. Ameloblasts, or enamel-cells.

No. 27. Section of normal enamel; tooth of kitten. Shows clearly the enamel-rods.

No. 28. Crown of bicuspid showing evidences of calcification of the pulp.

No. 29. Root of bicuspid, showing hypertrophy of cementum, and dental excrescence or pulp-stone within the pulp-chamber.

No. 30. Jaw of kitten with teeth and tissues in place.

No. 31. Section of developing tooth, showing fold of calco-globin, which is a continuation of tissue from the forming enamel at the apex, between the formed dentine and the layer of enamel-cells or ameloblasts. To my mind this is a strong evidence that the enamel is a secretion rather than the direct calcification of the ameloblasts.

No. 32. An enlarged view of the folds seen at the base of a developing tooth.

No. 33. View of the point of a developing tooth, with a fold of calco-globin faintly seen at the right.

No. 34. Haversian or vascular canal in human dentine running from the pulp chamber toward the cementum.

No. 35. Section of embryonic tissue, showing differentiation of the cells into osteoblasts and formed bone. These are in clusters, which by calcifying form the jaw-bone.

No. 36. First stage in the development of enamel-organ, with almost entire absence of dental groove.

President Carr. Gentlemen, we have heard from Massachusetts, New York, and Pennsylvania, and now we will have the pleasure of hearing from the West. I will call on Professor Black, of Jacksonville, Ill.

Dr. G. V. Black. Mr. President and Gentlemen: This has been a funny meeting so far, and a funny discussion; but I hope you will not expect anything funny from me, because I am not a funny man. We have had here a repetition in its most essential phases of a discussion that occurred in London fifty years ago, and I suppose they were as well satisfied that their views were correct as we are to-day. Some peculiarities have entered into this discussion that did not enter into that. There were some quibbles over technical points that were different, not yielding exactly the same product, but the trend of thought in that discussion and in this was very similar, in that one party was arguing for the vitality of the dentine, and the manifestation of that vitality in its diseases; while the other party was arguing as earnestly for the chemical nature of those diseases, and that vitality at most only modified them.

Discussion involving these points has been going on from that day to this, one party losing ground continuously, and never taking a step forward; the other party gaining ground as continuously, and never taking a step backward. When Mr. Tomes came into the field he came into it—that is, before he began writing—as a vitalist. When our French investigator in Paris (Magitot) came into the field—before he wrote—he came into it as a vitalist. They both worked with an earnestness that perhaps has not been equaled by many workers in the dental profession, with certain results which you all know. They yielded continuously upon the one side, and went forward as continuously upon the other. We know the result to-day. Tomes, through his son, has yielded the last point. Our French brother has yielded all but one, and if God preserves him he will soon yield that. Possibly the expression is not quite clear, as it stands in Magitot's work, but as I understand him he still supposes there is some resistance to the progress of dental caries by the vitality of dentine. It is very little that he has not yielded. This controversy was begun in earnest by Wm. Robertson, of Birmingham, England. There had been some skirmishing before, but the first big gun that was fired was by our friend Robertson, who wrote and published his book in 1835. Many men had talked and had published articles upon this subject before, but here was a book that, I may say, unsettled the world, and yet it never was fully received by the profession. The bottom facts were written down by him in such plain language, so true to nature, that it will yet be received. He was followed by Regnard, in France, in 1838, who perhaps wrote more exactly and more forcibly in relation to caries of the teeth—although in exceedingly quaint language, if his translator does him justice—than even Robertson. They agree precisely. Desirabode then took up the matter, denying the propositions of Regnard. At

that moment the voice of the profession of medicine, and of dentistry so far as we can call it then a profession, was with Desirabode, and he seemed to succeed. Even then he brought up the old idea, so popular, that the decay began in the interior of the dentine, as a conclusive proof that decay of the teeth could not be caused by acids produced by fermentation. Now, gentlemen, I wish to speak of this matter of caries beginning within the dentine, not simply because those men thought so, but for another purpose. From the time of Hunter, or fifty years before,—one hundred years ago, if you please,—it was held by men who had made this subject a study that caries of the teeth—decay (I like that expression better)—begins within the substance of the dentine, and works its way to the surface, possibly to the pulp. You will all say, "What dunces! What nonsense!" Why should they have held this theory, and worked over it, and struggled over it, until the time of Robertson? For he was the man who broke the backbone of this foolishness, though others had denied it before him. Were they not men of good observation, of sound judgment, and were they not careful men, let me ask you? Will we say that Hunter was not a careful man, or that Fox was not a careful man, and many others whom I might mention? Now, what is my purpose in bringing this up? Simply to show that men whom we regard as exceedingly good men, whose opinions we value very highly, are often—what shall I say?—mistaken. At least, they have come to hasty conclusions. This was a thing, seemingly, that any man of reasonably good observation might have decided for himself. And yet that was the first thing that was thrown at Robertson, and was considered a strong argument. He denied *in toto* that any such thing could occur, because, said he, decay of the teeth is the result of fermentation, with the formation of an acid which acts upon tooth-substance, *and must begin upon the surface.* He could not explain fermentation in that day; the knowledge of the world was not sufficient to give a rational explanation of fermentation. They used the words "fermentation" and "putrefaction." It required all the work of Schwan, Schroeder, Pasteur, Lister, Koch, Miller, and others who have worked in that field, to give us a rational explanation of the process of fermentation. And that explanation has come; and if, as dentists, we do not understand it, we are to blame for it. It is a purely physiological process. As students of physiology we should study it, even if it were not related to us in another way. Physiology is one thing the world over.

This brings us to another point. Physiology in its principal points is the same throughout all the manifestations of life, and we must get down to bedrock in this matter—study physiological prin-

ciples—if we would understand that which we see, and the diseases with which we must deal. Now I will get into trouble, for I know my friend over there will not agree with me in what I am about to say.

The cell is the unit of physical life. No matter whether that cell represents a complete individual as we see it in the amœba, or is a component of the complex individual, one among the multitude that make up the sum of the higher animal forms, or their individual parts, as we see it in the stellate reticulum of the enamel-organ, as depicted by my friend here on the blackboard. But then this doctrine has been taught so long and so well that everybody understands it.

Voices. Not much. Not in that way. That theory is exploded, etc.

Dr. Black. Everybody understands it,—outside of New York. I have said *the cell is the unit of physical life,*—I am not talking of spiritual life,—and it has certain characteristics in its dealings with matter which are common to all units of physical life that exist on this planet. These are its physiological attributes, and they may be summarized in four propositions.

First. Each cell is capable, when in contact with certain material, of furnishing or elaborating a substance capable of digesting food-material, or preparing it for absorption and assimilation. This you may call diastase, soluble ferment, unorganized ferment, enzyme, or by any of the words in use to represent the digestive agent.

Second. It is capable of assimilating the food so prepared. Assimilation results in growth.

Third. Every individual unit of life is capable of de-nutrition. This consists in shedding out, in the form of waste products, material that has once been formed into protoplasm, or used in connection with the nutritive process.

Fourth. It has the power of reproduction in a definite line of forms.

These four powers may be—yes, they are—varied widely among the different organisms with which we meet. They are capable of living on widely different foods, and the digestive agent elaborated is different—that is to say, adapted to the digestion of different foods. Then the waste products differ widely among the different organisms, and yet they have much in common, as we find them in the animal, the vegetable, and the so-called third class, the kingdom of the microbes. They are urea in the animal; alkaloids and the organic acids in the vegetable; the alcohols, organic acids, and the ptomaines in the microbes; alcohol as seen in the torula or vinous yeast fungus; acetic acid in the fungus of that name, and in case of

another micro-organism, as the bacillus anthracis, it is a ptomaine that is exceedingly poisonous. This class we call septic poisons. When we see certain peculiar symptoms in connection with a wound we say septic micro-organisms have invaded that wound, and observation teaches us that the patient is in almost as much danger as if stung by a viper. These substances are in every case the result of re-moleculizations of matter under the influence of the vital processes of living cells,—and this is fermentation.

In this we have the explanation in brief of the process of fermentation which Robertson and his contemporaries could not explain. The organism which produces caries has been found, and its essentials of physiology made out; the waste product—lactic acid—found, and its action in the production of caries explained. Some seem to regard this as a new theory, but it is only the further development of the theory of Robertson, propounded in 1835,—namely, that caries results from fermentation, with the production of an acid that acts upon the lime-salts of the teeth, and *acts independently of the vitality of the dentine.*

Now, these propositions are true, not only of the units of life as represented in the lowly organisms, the microbes, but they are true also of those high in the scale of life as well. In the lower forms, where the cells fall apart, each performs all of these functions for itself; but in those organisms that are formed by the union of many units of life there is a certain dependence the one upon the other,—a certain tendency to divide the work,—a tendency to specialization and the formation of specialized organs. Each cell makes a part of a certain group composing an organ,—and we have one group forming bile; another forming pepsin for the purpose of digesting food; another forming mucus; another separating the waste product of all (urea) from the blood; another doing this and another that in the general work of organism. Among these some little groups are for a time employed in building teeth. We find it stated by good authority in matters of physiology that these cells are never mixed up in the work they perform,—that each group attends to its own special duties. This leads to another proposition. *There is a certain impress made in the fertilization of the ovum or seed that preordains just how far this differentiation shall go.* Epithelium remains epithelium, though it is modified for the formation of the glands and various structures, including the brain, as my friend has stated (more properly the nerve or brain-cells, including those of the spinal cord), but never becomes connective-tissue. The connective-tissues, on the other hand, form the tissues of support and motion, and the blood vascular system, and never under any circumstances form epithelial tissue. There is a drawing on the blackboard representing the enamel-organ. We

have heard this evening that these tissues get mixed up, or changed the one into the other. We have had a mixed representation of the manner in which these ingrowths from the epithelial layer come down into the connective-tissue; extend more and more as the cells are multiplied, and form the enamel-organ; and how that in doing so these cells put out processes and recede from each other, the processes extending across the spaces. You have heard the terms "myxoma," "myxomatous tissue," and the statement that this becomes connective-tissue. Oh, dear, that is too bad! I was sorry he said it. Where did it come from? From what tissue was it developed? What is its purpose and destiny?

We have heard during this discussion the parable of John and Bob. Now, let me say that these boys are at it in earnest, and they are after the old man, my friend here, and unless he gets his foot out of that rut [pointing to the illustration of the enamel-organ] the boys will catch him and use him up completely.

That is all I want to say about that, except that this statement seems to be an outgrowth of a doctrine that appears to have emanated from New York, and of which I want to speak while talking about the jumbling of cell-forms,—a doctrine, if you please, that denies the existence of the cell as an entity in physical life; depreciating it to the position of a mere node of the so-called reticulum of bioplasson; and asserts that this reticulum is the life, or the life resides in this reticulum; that this reticulum runs continuously from node to node, mixing in around in every direction, pervading in continuity the entire animal. The man, according to this view, is a great big amœba, reaching out his arms and legs—a great amœba, not made up of units, but one life throughout,—spiritually, perhaps.

Dr. Atkinson. Even so.

Dr. Black. But he is made up of cells; and each of these cells has its peculiar individual life. My friend says "No." He tells you he sees these protoplasmic strings with his microscope. Let me say that it makes but little difference what this or that man may claim to see. The important factor is the interpretation of the thing seen. The interpretation placed upon these protoplasmic strings is substantially that in them resides the life of the organism, and that these threads are continuous throughout, uniting the life in one continuous whole, and it is also a denial of the individual life of cells of which physiologists have claimed that the body of the man is composed. And in the book that my friend here has given to the world this is distinctly extended to the vegetable kingdom as well, and illustrations are given of these strings connecting the life of the vegetable cells. This doctrine must stand or fall not alone upon what this man or that may claim to see in his microscopic preparations,

but upon the broader observation of physiological processes as well. To establish it, these different forms of observation must coincide in their results.

Now we are ready for some illustrations of physiological processes. First, in vegetable life. We will take a very simple thing, one that all of you can understand. I think you all know of the process of grafting of budding fruit-trees. All know of the bell-flower apple, and of the crab-apple. Now, a long time ago some man, seeing the difficulty of obtaining a given kind of apple from the seed, on account of the mixtures of pollen by which the flowers are fertilized, hit upon the conception of snipping off a little bud from the bell-flower tree—any kind of an apple will answer the purpose of illustration as well—and planting it in the tissues of the crab-apple. He knows nothing about cells or protoplasmic strings, but he snips off the little bud composed of only a few cells, comparatively, and plants it in among a multitude of cells composing the tissue of the crab-apple tree. He ties it—fixes it there—and hopes it will grow. It does grow. Now we have a few cells from the bell-flower mixed with the many of the crab-apple, and according to this string theory the life becomes one throughout. Our experimenter watches the growth of the little bud into a branch; after awhile a flower comes; and finally the fruit is developed. It looks like a bell-flower apple. It is a bell-flower apple, having the form and flavor. How is this? It is one life. The tree is a crab-apple tree, but the new branch is like the bell-flower, and the fruit is bell-flower. We see by this that while there is a physical union of those cells there is no life union. Each of the individual cells has a life of its own, and *its progeny retains forever the impress made in the fertilization of the seed;* no matter how often it may be transplanted to and mixed in with cells of a different nature. Therefore, the interpretation our friend places on the strings which he claims to see cannot be true.

Dr. Charles Miller. When you put the crab into the bell-flower what do you get?

Dr. Black. You will get the crab-apple every time. Now, an illustration in animal life. Let us suppose that by any kind of accident I have the skin torn off the back of my hand,—every bit of the epithelium is removed.

Dr. Atkinson. Every bit?

Dr. Black. Yes, every bit. Even the sweat-glands are destroyed, and no epithelial cells whatever remain. Now, we have certain cells in this body of ours that seem to be set apart for making repairs in case there is a breach of continuity such as this,—the wandering cells. They are continually creeping, amœba-like, through the tissues and floating in the blood-streams, and in case of such an acci-

dent they collect at the point, and are built up into granulations to fill the breach. But epithelium does not grow upon these granulations. What is the matter? We have heard this evening that epithelium produces connective-tissue, and on the same principle connective-tissue ought to produce epithelium when it is needed. The life is all one; there is no individuality! But it does not. The covering must await the slow process of the projection of the epithelium by growth from the margins of the wound.

Dr. Atkinson. You did not know how to treat it.

Dr. Black. We found out how to do it. We clipped off the epithelium from somewhere else, or from the body of another person, and stuck it down among the granulations. It grew from each point where we planted a few cells, and spreading out from these points soon covered the wound with new epithelium. It did not produce connective-tissue! At one time we had a negro with a great burn on his back. We clipped off little bits of epithelium from a white man and stuck them down among the granulations, and they grew. Now, if life is all one, if these cells have no individual life, the living matter of the cells grafted in should become mixed with the general life of that negro, and the effect would be imperceptible. But, no; the result was the production of a patch of skin just as white as that of the white man from whom it was taken.

This does not look much like sustaining the doctrine that there are no individual units of life that are maintained in the make-up of the individual man. That epithelium retains its individual life,—carries with it the impress made in the fertilization of the ovum from which the white man was developed, and carries its peculiar characteristics into strange places.

I think these illustrations sufficient to show you that this bioplasson doctrine will not bear the test of physiological scrutiny. No matter what claims may be made as to seeing this reticulum connecting the cells, the interpretation placed upon it is wrong, and all theories based upon it topple and fall to the ground.

Now, I want to talk of some other things,—this matter of the dentinal fibrils passing out between the odontoblasts. [Drawing on the blackboard, reproducing a sketch made by a former speaker of the dentinal fibrils passing from the pulp into the dentine, and passing between the odontoblasts, instead of arising from them.] You see these lines passing out between the odontoblasts with little offshoots here. Let me say that it required a hundred years of observation and discussion before a man arose who observed sufficiently well to declare that caries did not begin within the dentine. Should we fall out with a man because he is mistaken? No. We should hope that he will look further. This is the result of

faulty observation. I have certainly done enough of this class of dissecting to have some right to speak. I had stained sections of teeth with chloride of gold, and studied them while my friend here was still in Europe making illustrations from sections cut from the frozen cadaver,—which, I must say, was a beautiful work, and I wish he had done more of it. And when this reticulum business was first introduced to the American Dental Association I had some chloride of gold stainings there to show. I remember that Dr. McQuillen made a speech about it at the time, and my brother here on my right and I got into a row about it.

Dr. Atkinson. I was there.

Dr. Black. And we have been good friends ever since. I know just how my brother got into this difficulty with the dentinal fibrils. His picture is made from a diagonal section, and it deceived him. He saw the things he describes, but he did not get the true view of them. But before asserting that the dentinal fibrils do not arise from the odontoblasts, as has been held by the best observers of the world, he should have obtained every possible view of them; he should have taken them apart one by one and examined them individually, so as to prevent all possibility of error.

Several Voices. It can't be done. Tell us how to do it, etc.

Dr. Black. It is a simple matter of technique. I can tell you how if you wish me to. When you have extracted a tooth, throw it at once into Mueller's fluid, and let it stay about a week. Then crack it in a vice. A little experience will enable you to split the tooth lengthwise without crushing the pulp. Now, catch the pulp with a pair of pliers, and pull it out of its bed. Some of the odontoblasts will adhere to the pulp, and the fibrils to a considerable length will be pulled out of the dentine, while some of the odontoblasts will remain, adhering to the dentine, with the fibrils pulled out considerably from the canals. By placing the pulp in a freshly-filtered solution of Mueller's fluid, and examining it with a good hand-lens, you can tell where the fibrils have pulled off, or remained attached to the pulp, by the fuzzy appearance of its margins produced by the fibrils. If it is found that some have adhered to the dentine, which is usually the case, you may put that part of the tooth into staining-fluid, and stain before removing them if you like. To remove them, take a knife with a rounded point with which you can plow along down that part of the canal or pulp-chamber in which the odontoblasts have remained; have fluid in the canal,—glycerine is the best,—and bring the blade down on a glass slide. You will be pretty sure to get a good many odontoblasts, and the most of them will hang together in flakes so that the individual cells cannot well be seen. Using now your dissect-

ing glass, break up these with needles somewhat, or simply shake them about to detach any loosened cells; then lift out the larger flakes and lay them aside. Lay a cover-glass over the remainder, and examine it with a one-fourth or one-eighth inch glass. The chances are that you will find a considerable number of single odontoblasts with fibrils attached, that are four or five times as long as the odontoblasts; or the fibril may be short, or there may be no fibril at all; for in some cases they will not be stretched out in the canals in withdrawing the pulp. Some failures will be made, but usually it does not require many trials to get good views of these cells with a considerable length of fibrils. You never get the true form of the odontoblast in sections cut from tissues hardened *in situ*.

Now, as to the enamel and the diseased condition described here to-day, I do not care to talk. This interpretation is based upon the theory of protoplasmic strings, and of that I have said enough. It my friend here wants to picture wire screens all over his histological drawings, let him do so. It is not so much what one sees, after all, as his interpretation of what the tissues do, that is important; and of this I want to talk for a moment.

The odontoblasts line the pulp-chamber, or cover the tissues of the pulp, and their processes, the dentinal fibrils, extend into the dentinal tubes and through them to the periphery of the dentine. We have an affection beginning on the surface of the tooth; caries, or erosion, or absorption has exposed the distal ends of the fibrils. What is the result? We get hyperesthesia. Where do we find vital changes? John Tomes has been through this course of study long ago, and he began with the inflammatory theory. But he found that none of the elements necessary to produce the morphological changes which we know as inflammation could get into the dentine. The leucocytes could not get in; the blood could not get in. No morphological changes of the tissue itself could be discovered that in anywise resembled inflammation. Therefore, he concluded that dentine could not inflame. Still, he was not willing to give up the idea, and he searched this tissue to see whether or not it manifested any changes peculiar to itself. And the more he studied the subject the less he found of the doings of vitality, until he yielded everything. Still, the dentine is sensitive, and sensation is a manifestation of vitality. It is a law of physiology that the processes of cells are especially receivers of impressions. This is most strongly manifested in the nervous system,—the nerves are processes of cells. But it is true of other tissues as well. Where is the pathological change accompanying that sensitiveness manifested? The dentinal fibrils reach through the dentine; they are processes of living cells; and the morphological changes are found in the pulp-chamber, in or

about the cells of which the fibrils are processes. In one case of erosion the pulp lays down more dentine; in another the layer of odontoblasts becomes atrophied; in another the whole pulp may become hyperemic, etc. But you cannot demonstrate changes attributable to vitality in the dentine. Now, I know there have been some such claims based on the protoplasmic string notion, but these findings may be duplicated in teeth that have never given any history of disease whatever. The things seen were there from the time of the development of the teeth. It is another case of faulty interpretation.

The term "fixed material" has been used in this discussion. The term is a good one. What do we mean by it? The word *organic* is sometimes used to represent anything that has been built by the life-process. Fixed material is an organic material forming a part of the organism, but not possessed of life, and is incapable of performing any vital function. It is passive.

Dr. Atkinson. Tell me what you mean by life.

Dr. Black. That which does the four things I talked about a while ago.

Dr. Atkinson. Do you mean energy?

Dr. Black. No, sir; that word does not explain it.

Dr. Atkinson. What is life, then?

Dr. Black. I don't know.

Dr. Atkinson. And I don't know.

Dr. Black. These enamel-prisms are fixed material. This dentine, the hard portions, all except the dentinal fibrils, is fixed material, and is entirely passive. It may be acted upon, but it cannot itself act. We have had this afternoon a description of the formation of the enamel, and the organ which forms it, and have seen it illustrated by those beautiful photo-micrographs. It is formed from within outward, and the organ from which it has derived its nutrition has disappeared. The life-process has built this enamel,—laid it down there; and old Dame Nature, life, has stepped backward on tiptoe and gone off and left it, as a good mother would do with her sleeping child for fear of waking it; but, unlike the good mother, has never returned.

B. C. Nash, D.D.S., *Secretary.*

NATIONAL DENTAL ASSOCIATION.

The next regular biennial meeting of the National Dental Association of the United States of America will be held at Washington, D. C., July 27, 28, and 29, 1886.

R. B. Winder, *President*, Baltimore, Md.

R. Finley Hunt, *Secretary*, Washington, D.C.

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

The third annual meeting of the National Association of Dental Faculties will be held at Niagara Falls, on Wednesday, August 4, 1886, at 3 P. M.

C. N. Peirce, *President*, Philadelphia, Pa.

H. A. Smith, *Secretary*, Cincinnati, Ohio.

SOUTH CAROLINA STATE DENTAL ASSOCIATION.

The sixteenth annual meeting of the South Carolina State Dental Association and State Board of Dental Examiners will be held in Columbia, S. C., commencing on Tuesday, June 8, 1886, at 10 o'clock A. M. A cordial invitation is extended to all members of the profession to attend the meeting.

R. Atmar Smith,
Rec. Sec. S. C. D. A. and Sec. Board of D. E.

NEW HAMPSHIRE DENTAL SOCIETY.

The tenth annual meeting of the New Hampshire Dental Society will be held in Concord, N. H., June 15, 1886, at 11 o'clock A. M.

All dentists of the State are cordially invited to attend.

The Board of Censors will meet at the Phœnix Hotel, on Monday evening, June 14, for the examination of candidates for license to practice.

E. B. Davis, *Secretary*, Concord, N. H.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA.

The sixth annual meeting of the Odontological Society of Western Pennsylvania will be held at Dr. W. B. Libbey's office, Washington, Pa., on Tuesday, June 8, 1886.

Members of the profession are invited to attend.

C. V. Kratzer, *Secretary*, Braddock, Pa.

INDIANA STATE DENTAL ASSOCIATION.

The twenty-eighth annual meeting of the Indiana State Dental Association will be held in Indianapolis, commencing Tuesday, June 29, 1886, and continuing three days.

All members of the profession are cordially invited to attend.

The State Board of Dental Examiners will also meet at the same time and place.

R. W. Van Valzah, *Secretary*, Terre Haute, Ind.

SOUTH DAKOTA DENTAL SOCIETY.

The third annual meeting of the South Dakota Dental Society will be held at Mitchell, commencing June 19, 1886, and continuing for three days.

O. M. Huestis, *Secretary*, Aberdeen, D. T.

MISSOURI STATE DENTAL ASSOCIATION.

The twenty-second annual meeting of the Missouri State Dental Association will be held at Sweet Springs, Mo., beginning July 6, 1886, and continue four days.

A cordial reception awaits every dentist who will come.

G. A. Bowman, *Chairman Ex. Com.*,
2624 Washington Ave., St. Louis.

MINNESOTA STATE BOARD OF DENTAL EXAMINERS.

The Minnesota State Board of Dental Examiners will hold its next regular meeting, for the purpose of examining applicants for permission to practice in the State of Minnesota, on Saturday, July 25, 1886, at St. Paul, immediately after the meeting of the Minnesota State Dental Society.

J. H. Martindale, *Secretary*,
Nos. 412 and 414 Nicollet avenue, Minneapolis, Minn.

PENNSYLVANIA STATE DENTAL EXAMINING BOARD.

The Pennsylvania State Dental Examining Board will meet at Cresson Pa., concurrent with the State Dental Society, Tuesday, July 27, 1886.

Persons who intend to come before the board for examination are requested to notify either the president or secretary.

W. E. Magill, *President*, Erie, Pa.
J. C. Green, *Secretary*, West Chester, Pa.

UNIVERSITY OF PENNSYLVANIA—DEPARTMENT OF DENTISTRY.

The seventh annual commencement of the Dental Department of the University of Pennsylvania was held, in connection with that of the Medical Department, at the American Academy of Music, Philadelphia, on Saturday, May 1, 1886, at 10.30 o'clock A. M.

The valedictory address was delivered by Joseph Leidy, M.D., LL.D., professor of anatomy.

The number of matriculates for the session in the Dental Department was ninety-eight.

The degree of D.D.S. was conferred upon the following members of the dental class by William Pepper, M.D., LL.D., provost of the university:

NAME.	RESIDENCE.
James E. Adams	Illinois.
A. F. Bennefeld	Germany.
W. A. Borden	New Jersey.
C. M. Bordener	Pennsylvania.
W. V. Bradley	Connecticut.
John Campbell	Pennsylvania.
W. M. Chambers	Pennsylvania.
G. T. Cookingham	Massachusetts.
W. W. Danel	Illinois.
C. H. Davis	New Hampshire.
J. S. Dennison	New York.
Victor Dumas	Cuba.
C. L. Ensign	New York.
F. R. Griffin	Ohio.
W. W. Hawke	New Jersey.
J. B. Hills	District of Columbia.
F. H. Howland	Massachusetts.
W. S. Huber	Pennsylvania.
H. D. Hurlburt	Vermont.
L. A. Lamoutte	Porto Rico.
W. L. Long	Pennsylvania.
A. A. McIntyre	Pr. Edward's Island.
B. G. Maercklein	Wisconsin.
R. E. Maercklein	Wisconsin.
L. J. Miller	Pennsylvania.
U. S. G. Moore	Pennsylvania.
A. Nittinger	Pennsylvania.
J. Paranhos	Brazil.
F. Pereira	Brazil.
E. P. Quick	Pennsylvania.
O. B. Raupp	Brazil.
C. H. Rees	Kentucky.
C. H. Richter	Wisconsin.
F. J. Schwarzschild	California.
H. G. Seelye	Connecticut.
G. H. Shannon	New York.
F. I. Sumner	New York.
C. W. Upp	Illinois.
A. T. Webb	Illinois.
J. H. Wible	Pennsylvania.
L. M. Wiggins	New Brunswick.

BIBLIOGRAPHICAL.

Diseases of the Digestive Organs in Infancy and Childhood, with chapters on the Investigation of Disease, and on the General Management of Children. By Louis Starr, M.D. With colored plate and other illustrations. Octavo, 385 pp. Philadelphia: P. Blakiston, Son & Co., 1886. Price, cloth, $2.50.

We have here an orderly presentation and systematic discussion of a class of disorders which are generally too briefly considered in works on the diseases of children. The volume is divided into three parts,—the investigation of disease, diseases of the digestive organs, and the general management of children. The fifty-eight pages of Part I. are full of interesting and valuable suggestions. The *features* of disease, described under different headings, include both the normal and abnormal appearance, and the pathological significance of the latter. This portion of the book must prove of great value to inexperienced practitioners. Part II. treats in five chapters of affections of the mouth and throat, of the stomach and intestines, of the mesenteric glands, of the liver, and of the peritoneum. Part III. is devoted to a consideration of feeding, bathing, clothing, sleep, and exercise, evincing careful observation and study,

and giving deserved prominence to the great importance of proper food, regulation of the clothing, and other hygienic elements. The question of the artificial feeding of infants is most intelligently discussed, and includes a schedule of the proper diet for a child up to three and a half years of age. The therapeutics of the author are to be commended as eminently discriminative and conservative, while his style is clear, accurate, and without redundancy.

The teaching in the section on dentition shows familiarity with the pathological aspects of that process, and is a notable advance beyond that of most of the text-books.

In conclusion, the volume has been gotten up in an exceptionally handsome form, pleasant to the touch and the sight,—a worthy vehicle for the valuable matter which it carries.

OBITUARY.

DR. ADOLPH P. PRETERRE.

Died, in Paris, France, March 20, 1886, Adolph P. Preterre, M.D., in the sixty-third year of his age.

Dr. Preterre was a graduate of the New York College of Physicians and Surgeons, class of 1849. He subsequently studied for three years in Paris, but in 1852 returned to New York and entered into partnership with his brother Eugene, who had established a dental office in the Bowery as early as 1838. He retired from business in 1879, and was succeeded by Dr. B. H. Dupignac. For several years past he has resided in Paris.

HINTS AND QUERIES.

Experiences with Cocaïne.—I have used cocaïne since February, 1885, and found it a perfect local anesthetic. On several occasions I have used two drachms of a four per cent. solution at one sitting, and removed the entire denture of one maxilla without the slightest pain or any unpleasant after effects. In certain idiosyncrasies, however, the local application of cocaïne produces nausea, lasting in some cases only a few moments; in others ten to twenty minutes or more, but without vomiting. With a few patients (so far confined to females, and when a quantity only sufficient for anesthetizing one tooth was used) the effect was distressing,—difficulty of breathing and palpitation of the heart. When placed in a recumbent position, the corsets loosened, and stimulants given, the patient soon recovered. In a majority of the cases no stimulant was used. Whisky or brandy was given to some before, and to others after, the injection of cocaïne. Nausea was produced in some cases when a stimulant was not used, and also when given either before or after the administration of cocaïne.

A patient had cocaïne administered in the morning without taking a stimulant and was made sick. In the afternoon of the same day he took a big drink of

brandy previously; had cocaïne applied and a tooth removed, without pain and without any unpleasant effects. I have had patients—men, of course—present themselves in quite an unsteady condition, from the effects of too much imbibing, who were badly nauseated after the cocaïne was inserted.

On one occasion I had just used cocaïne and removed the entire lower denture (the upper having been extracted the day previous, cocaïne being used) for a lady patient, who was not in the least unpleasantly affected by the two drachms of a four per cent. solution that had been used, when another lady presented herself to have one tooth extracted. Cocaïne was used, and the tooth removed without any pain, but the patient was sick for an hour or more. While this last patient was recovering another lady came in to have one tooth extracted. Cocaïne was used, and the tooth removed without pain, but the patient had to recline on the sofa for fifteen minutes to recover from nausea. The lady patient for whom two drachms had been used kindly attended to the other two, who had had only a sufficient quantity of cocaïne to anesthetize one tooth each. A few patients speak of a "going off" effect; the hands have a "tingling" sensation, and the feet feeling as when "asleep."

Some are not apparently affected otherwise than locally, while others are stimulated to about the extent that a glass of wine might produce, and a few as if they had imbibed something stronger,—becoming quite communicative and confidential, and this when no whisky or brandy had been taken. I have used cocaïne for children, the middle aged, and old persons, male and female; white, *colored*, and black; delicate and robust, and of all temperaments; with stimulants, either before or after using cocaïne, and without stimulants, but am unable to tell when a patient may be expected to be exempt from nausea subsequently. Not more than one in twenty is unpleasantly affected, and I have had but four cases that could be considered seriously sick.

If cocaïne is properly applied, any operation in dental surgery can be painlessly performed. It should be used hypodermically. The four per cent. solution is sufficiently strong. For molars, bicuspids, and cuspids, apply to both sides of the tooth; to the labial surface is sufficient for incisors. For the removal of a pulp, inject the pulp and wait five minutes, when it can be extracted without any pain. For sensitive dentine, inject as for extracting a tooth. Its use in dentistry has not proved satisfactory to many practitioners, but the fault is not with cocaïne.—O. J. Bond, *Chester*, *S. C.*

Iodoform Cotton.—I would like to call the attention of the profession to the use of iodoform cotton, whenever cotton is necessary to be employed in the mouth in the treatment of teeth or gums. My attention was first drawn to it by using it in a severe case of necrosis of lower jaw over a year and a half ago, and since that time I have had more satisfaction in its employment than in any other agent that it has been my good fortune to meet with for a long time.—J. M. Whitney.

To the Editor of the Dental Cosmos:

It may be of interest to some of my professional brethren to learn that I have in my possession the following dental anomalies: Five cuspids with two roots each; five bicuspids, each having three distinct roots; twelve lower molars, three-rooted; three lower molars with four roots; one lower molar with five roots; twelve upper molars, four-rooted; two upper molars, osseous union; two lower incisors, osseous union; four cases of osseous union of temporary upper central and lateral; also, quite a number of third lower molars, incisors, and cuspids of the most extraordinary and curiously-shaped roots; five upper molars, fine specimens of

exostosis; one lower molar, entirely incrusted by a large mass of salivary calculus. I also have a cuspid and a bicuspid each one and one-quarter inches in length; also an upper and a lower molar, regularly shaped, but of extra large dimensions. All of these teeth have been extracted by me in the course of my practice.

The collection numbers at present sixty-six fine specimens, which may be seen at my office at any time.—BERNARD HESS, D.D.S., *New York*, *N. Y.*

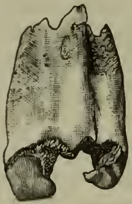
DOUBLE-ROOTED CUSPIDS.—Within the last six years I have extracted three such, each one of which was a good specimen, having two distinct and full-length roots. They were all extracted from the lower jaw, two being from the mouths of females, and all from persons past thirty years of age. I also have two right lower molars, the first and second, taken from the jaw of a man about twenty-eight years of age, each of which has three roots as large and divergent as any superior molar I ever saw. I have also a specimen consisting of a right superior central and lateral incisor, the roots of which are fused for more than one-half their length; the enamel is also perfectly fused for fully one-half of the distance, beginning at the gum line extending toward the cutting edge. I extracted it from the mouth of a lad thirteen or fourteen years of age.—W. C. BUNKER, *Oregon*, *Ill.*

TWO ANOMALOUS CASES.—Twin deciduous teeth are not uncommon, but triplets are rare and interesting to one inclined to study into the etiology of such anomalies. I have in my possession a triplet which I extracted from the mouth of a boy somewhat less than three years of age. It represents the right upper lateral incisor and cuspid with a supernumerary incisor partly between and partly to the labial side of the others, making quite a prominence, as shown in Fig. 1. They are united from end to end, though the crowns are but slightly united.

Fig. 2 represents another triplet taken from the mouth of a little girl. It occupied the same position as the other, and was composed of the same teeth, the supernumerary occupying a more intermediate relation than in the other case, and prominent enough to interfere with the regularity of the arch. These roots are united nearly to their apices, the supernumerary being a little longer than the others, which is not usual with supernumeraries. I am not able to say whether the crowns were united throughout, as they were so much wasted by decay that the central tooth was broken in the extraction. The lines of demarkation are distinct on either side of this specimen.

FIG. 1.

FIG. 2.



I have also two lower cuspids and a lower central incisor that have two roots each.—ISAAC DOUGLASS, *Romeo*, *Mich.*

A DENTAL ANOMALY.—Inclosed please find photograph of a superior left central incisor having two well-marked roots. This tooth I extracted from the mouth of a lady aged thirty years. It is the only specimen which I have ever seen of a double-rooted incisor.—M. PALMITER.

I HAVE a patient with two well-developed left superior lateral incisors. They are in normal position, and so are all the other teeth except the central of that side, which I removed from the gum lying upon the lateral under the lip.—T. D. I.

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

FUNCTION: ITS EVOLUTION AND INFLUENCE.

BY C. N. PEIRCE, D.D.S., PHILADELPHIA, PA.

In preparing the paper on "Function: Its Evolution, and Influence on Organization," which was read by invitation before the New York Odontological Society, November 10, 1885, it was very far from the writer's intention to provoke a theological controversy, or to disturb any one's religious belief, much less to make a display of his own. His surprise can, therefore, be imagined when Dr. Atkinson, in opening the discussion (if such it may be called) upon the paper, which took place at the expiration of the forty minutes occupied in reading it, announced that the production was a "materialistic domination of a materialistic teacher," and, after some further remarks ridiculing two or three well-substantiated illustrations which were cited, the application of which he seemed unable to appreciate, stated that he could "hear Leidy, Cope, and Marsh all through the paper," and, therefore, did not give the writer "credit for being original." The inference meant to be drawn from this remark was that the essayist had copied from the publications of these gentlemen the substance of his paper and given no credit therefor. The doctor was certainly ignorant of the work and writings of at least one of these gentlemen, as, a few months before, in speaking of the character and habits of the first named,—Prof. Joseph Leidy,—the writer heard him state that the old man Leidy was dead, and that the son had not near the talent and spiritualistic character of the father. The scientific world has never heard, and probably will never hear, of but one Leidy, and where two or three men of science, without regard to locality, are gathered together Prof. Joseph Leidy's name and labors are as familiar to them as their alphabet. He holds to-day, and for nearly thirty-five years has held, the professorship of anatomy in the University of Pennsyl-

vania, and as a zoologist, palæontologist, and microscopist he stands preëminent. He has published upon these and kindred subjects hundreds of papers which are known and valued by every scientific body in the world. Yet this teacher in New York City and critic for the New York Odontological Society, on the evening of November 10, was evidently as ignorant of Prof. Joseph Leidy's work and writings, as well as of Profs. Cope's and Marsh's, as a new-born child, or he would never have made the above statement. Can it be that the inspiration upon which Dr. Atkinson relies so implicitly for his facts has forsaken him?

Dr. Dodge, who very properly stands as the representative of culture in the dental profession, stated in his remarks that it was the evident intention of the author of the paper to offer a substitute for the old notion that all organized beings are planned by an Infinite Intelligence, and caused to exist by an Infinite Creative Power,—a "substitution of something that inheres in the organism for the action of God Almighty." The text of the paper shows that this was simply begging the question, and was as uncalled for as it was unscientific. Whatever may have been the essayist's individual views regarding the existence of a personal God or a superintending or overruling Providence, he certainly said nothing on that occasion which warranted the assumption and assertion.

The members of the New York Odontological Society were only invited to a consideration of the evidences that were presented as to the influences that function or use, nutrition, and heredity exert on the *origin*, the *health*, the *morphology*, and the *structural arrangement* of organs and tissues; or, in the language of Lamarck, that "the production of a new organ in an animal body results from the supervention of a new want continuing to make itself felt, and a new movement which this want gives birth to and encourages; * * * that the development of organs and their force of action are constantly in ratio to the employment of these organs." But this cultured gentleman entirely ignored the arguments presented, assumed the rôle of guardian and essayed the defence of the Supreme Being, who he thought was in this paper robbed of the credit due him for infinite intelligence, infinite creative power, and superintendence of the development of all organisms. The doctor having placed a construction upon the essayist's language largely the result of his own imagination, confidently asserted that "the argument is so intrinsically poor and weak that it amounts to nothing better than this." If the doctor had been more explicit, and had stated just what proposition in the argument he was combating, it would have been more satisfactory. If the essayist understood himself and the meaning of his own words, no argument regard-

ing the existence of God, or criticism of His wisdom and power, was made or attempted. It was asserted, and an effort was made to sustain the assertion by numerous illustrations, that the necessity of an organ induced by change of environment preceded the development of such organ, and that function (use or non-use) did direct or modify its morphology and capability. Not one of the cited illustrations did the doctor deign to notice, but set up an imaginary scare-crow, that he might have the pleasure of picturing in well-chosen words its peculiar features. Intrenched behind a vulnerable rampart, he might be likened to the setting bird which, fearful of the disturbance of its nest, endeavors to divert attention by fluttering in another bush. This little theological dodge was so gracefully performed that it was not unpleasant to witness.

Belief as to the existence or non-existence of a Divine Being, possessing attributes of wisdom and power in a superlative degree, should not in any way prevent the study of the influences of mechanical and hereditary forces on organized matter, nor should the results which may be recognized from such forces disturb the faith of the investigator. The query of the essayist, if it must be made to have a theological significance, was not with reference to the limitation of creative power, but as to its plan, order, and method of action. Was this too momentous a question for the New York Odontological Society, which claims to be the embodiment of dental science? So it seems.

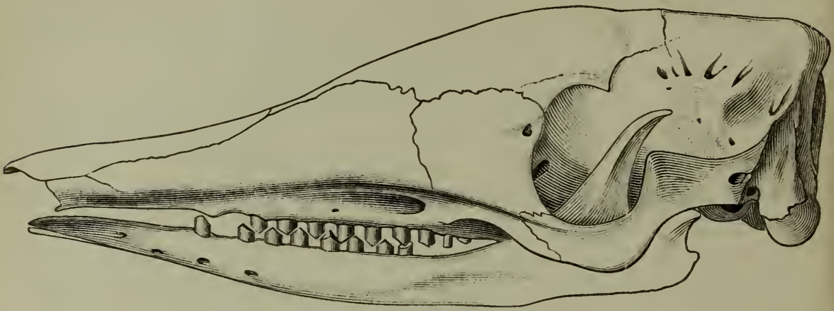
The writer of the paper is induced to believe that the whole plan of creation is but an endless succession of cause and sequence, influencing all matter, animate and inanimate, and to consider this as the result of a "forthgoing, consistent, consecutive, advancing, and developing plan"—inherent in or subordinated to an immutable law governing matter. In either case the various phenomena presented by the constantly changing combinations of atoms certainly constute a legitimate subject for consideration by a scientific body. The student of nature, though firm in the consciousness that all things work together for good, cannot rest from labor while forces are undiscovered and their influences remain unsolved. On the other hand, if these phenomena are the unstable results of a Creator's changing moods, varying under like conditions, uncertain and aberrant in execution, then the less science has to do with the wonders of nature the better.

The function of science is to discover and measure forces, to observe laws, and record results. If it can lift the veil which has hidden the past, and see in the far dim distance the incandescent sphere, and from that ball of fire trace its unstable elements through their illimitable changes, until from out of a fortuitous combination

of these inorganic atoms living matter is evolved, and from this primordial mass observe the unfolding of unicellular and multicellular organisms, and from these again through the labyrinths of vegetable and animal products discover how man, the highest vertebrate, has been evolved, it is certainly interesting, legitimate, and worthy of every effort for which time and talent give opportunity.

Some additional evidence to support the positions taken in the paper under notice will be comprised in a few illustrations and the text, to show how the shape and infoldings of the enamel corre-

Fig. 1.



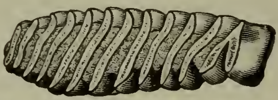
Side view of Skull of a Seven-banded Armadillo.

spond with the food-habit and movements of the mandible; and that these infoldings are invariably of such a character as to be most efficient in the division or trituration of food as the necessities of the animal demand them for one or the other purpose, or in case the enamel is not needed, how in time it has disappeared, leaving the dentine of the tooth entirely nude or free from that protecting covering.

Fig. 2.

Vertical view of grinding-surface of Lower Molar of Muskrat.

Fig. 3.

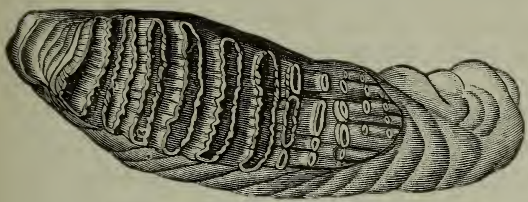


Vertical view of Molar of Capybara.

Fig. 1 is a side view of the skull of a seven-banded armadillo, which beautifully illustrates the condition of the group by the absence of enamel on the teeth. That this condition has been reached by a process of retrogression or degradation seems to be quite fully established. Charles S. Tomes has demonstrated that the tooth-germs of the nine-banded armadillo have distinct enamel-organs, which are subsequently aborted as the tooth comes to maturity. This discovery Mr. J. L. Wortman, in his article on comparative anatomy in the forthcoming "System of Dentistry," says "is important, since

it indicates pretty clearly that the loss of enamel is a mark of degeneracy, and leads indirectly to the conclusion that the armadillos at least are descended from ancestors with enamel-covered teeth, who, in all probability, were the possessors of a completely developed

Fig. 4.



Vertical view of Molar of India Elephant.

Fig. 5.

Vertical view of molar of species of Horse.

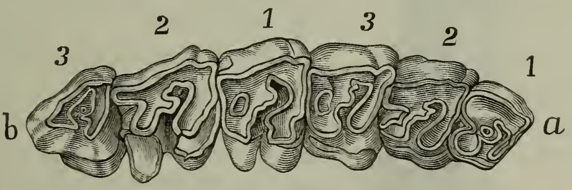
second set." The only assignable cause for this degenerate condition—the absence of enamel—is the food-getting habit, this group having a long tongue covered with a viscid secretion for the capture of insects, which are swallowed with little or no mastication.

Fig. 6.

Vertical view of Molar of an Extinct Horse.

Figs. 2, 3, and 4 represent respectively the lower molar of a muskrat, a molar of the capybara, and the molar of an elephant. The three represent complex and specialized teeth, and have a marked similarity in the infoldings of the enamel. Figs. 3 and 4 are almost identical in this respect, and though one is from the mouth of a small rodent, and the other from one of the largest of the proboscidea, the antero-posterior movement of the mandible has in each given a similarity in the structural arrangement of the enamel that cannot well be accounted for upon any other hypothesis.

Fig. 7.



Vertical view of Molars of Rhinoceros.

Figs. 5 and 6 are representations of the teeth of the horse,—the former of a modern variety, the latter of an extinct species (equus major), obtained through the kindness of Prof. E. D. Cope, and is

FIG. 8.

Vertical view of Lower Jaw of Virginia Deer.

probably the most complicated in its enamel-foldings of any tooth found in the vertebrate series. The excursions of the mandible must have been extensive and varied to have induced the duplicated and irregular foldings which are here so beautifully represented.

Fig. 7 represents the superior molar dentition of the rhinoceros,—*a*, anterior; *b*, posterior,—premolars and molars. Mr. Wortman, in the above quoted article on the comparative anatomy of the teeth, says, "In the earliest forms the molars are more complex than the premolars, but in the later and living species the premolars are as highly organized as the molars, and like them in form." The accompanying figure well represents this. Their resemblance to the teeth of the horse is very striking,—due to the fact of having a common ancestor (hereditary influence) as well as similarity in diet and jaw-movements.

Fig. 8 represents the lower jaw of the Virginia deer. The specialized dental organs of this animal—the upper and lower molars—are marked by the double crescents formed by the foldings of the enamel, and representing the W pattern which is so almost universally conspicuous in the herbivorous or grass-eating animals. The elevation of these sharp cusps, and the deposit of thick layers of cementum filling up the valleys, are conditions which provide these animals with efficient triturating surfaces; while the condylar attachment with the glenoid cavity permits of a liberal excursive movement, so that with these combinations this deer, in common with most of the group of herbivora, has

an adaptation of means to an end that fully illustrates the evolution of a complexity and definiteness of structure in response to the ever-acting forces controlling adaptation to environment.

For the electrotype figures given in this paper, with the exception of Fig. 6, the author is indebted to Lea Brothers & Co., they having been furnished by Mr. J. L. Wortman, A.M., M.D., in illustration of his article on the comparative anatomy of the the teeth of the vertebrata, for the "System of Dentistry," which is now in press.

In the above only a few representations of the result of mechanical force are given. If necessary every group of animals, where the teeth have passed beyond the transitional condition, could be cited to render additional evidence, and no individual case would speak more emphatically than the incisors of the rodents, where from persistent pulps the tissues are developed and arranged so that the animal may always be provided with sharp, cutting instruments in the anterior part of the mouth.

In summing up the result of the investigation, the following postulates may well represent in a condensed form the substance of the argument—which the writer hopes his friend Dr. Atkinson will not say have been copied from Leidy, Cope, or Marsh.

1st. That the tendency is to the suppression of organs and tissues not used, and the development of those most used.

2d. That the teeth, notwithstanding their density, are, like the more vascular tissues, subject to modification from use and disuse.

3d. That the food-habit and cumulative results of heredity have been important factors in shaping tooth-forms.

4th. That the degree in which teeth are modified from a simple type is in correspondence with the differences in the degree of resistance to be overcome in the mastication of food.

5th. That the restriction and limitation of diet has contributed to the specialization of the teeth.

6th. That the varied and omnivorous diet of the human family and the disuse of their teeth have retarded the specialization of these organs.

7th. That an invariable result of the effort of specialization is a reduction in the number of teeth.

8th. That in the trituration of food there is a constant effort to establish such excursions or mandibular movements as will be most efficient in this pre-assimilative process.

9th. That the mandibular movements in the effort of mastication must largely control the specialized condition of the teeth, the glenoid plates, and the condyles.

DENTAL CARIES.—X.

BY A. MORSMAN, M.D., D.D.S., IOWA CITY, IOWA.

(Continued from page 346.)

PART THIRD—SEQUELÆ.

3. Lesions of the Periosteum.*

Periostitis.—This disease as a result of caries is always subsequent to the death of the pulp. We do not here have to do with that very common phase of periostitis which is post-operative and has its etiology in misapplied or over-zealous manipulation. We are concerned only with that form which is the result of the carious process. I have already alluded to periostitis as an accompaniment of inflammation of the pulp; but this is transitory, and requires no treatment. I believe it to be merely the inflammation of continuity, and feel certain from clinical experience that the removal of the cause, either by treatment or spontaneous death of the pulp, will invariably result in a cure. *But* if, after the death of the pulp, its remains are left in the canals without sufficient vent the periostitis will become pronounced as a disease *per se*, and must be treated as such.

Periostitis as thus limited has but one cause, viz., the retention in the canal or pulp-cavity of putrescent matter. This statement is' perhaps, open to criticism as being too narrow in its limitations, but I believe it to cover the entire ground.

Matter in the pulp cavity of a tooth, whether it be pulp-tissue or foreign matter from foods, etc., undergoes putrefaction, and gases are formed which have a pernicious influence upon the periosteum. Whether this effect is toxical or mechanical is as yet uncertain. The latter would seem to be the case, inasmuch as no effect is produced when the cavity is open and the gases can freely escape, but the closure of the orifice produces the definite sequence of periostitis.

At some time after the death of the pulp the canal, full of putrescing débris, is accidentally closed by the impaction of food or other matter, and the pressure upon the periosteum caused by the escaping gas through the apical foramen (the only outlet) causes the inflammation. This seems to me the only rational explanation.

Clinical History and Appearances.—Beginning as a slight uneasiness on that side of the face where the offending tooth is located, the pain soon becomes more pronounced, but not well defined. If it

* I use the term "periosteum" because I believe it to be anatomically correct. Cement is modified bone, and its membrane is modified periosteum. The alveolus is true bone, and the layer of membrane overlying it is true periosteum. As a whole, the alveolo-dental membrane does not differ more from typical periosteum than periosteum differs in different parts of the osteological system. It is periosteum in structure and periosteum in function.

seems to be in the teeth it is still not easy to locate it. More frequently it appears in the temple, ear, or is distributed over the whole side of the face. Not uncommonly the homologous tooth of that side seems to be the troublesome member, especially in the molars. These vague, indefinite pains may extend over a period of twenty-four or forty-eight hours. During this time the patient is more apt to call his disease "neuralgia" than "toothache." This is the prodromic period, and I am inclined to the belief that it is pretty constant, although at times the pains are definite and located in the tooth from the inception of the disease. Should the patient be of a character not easily influenced by pain, or with his attention otherwise engaged, these first symptoms might pass entirely unnoticed. Following this period the tooth itself begins to be uneasy. There is a feeling of soreness that is constant and tenderness when bitten upon; but after the first impact biting seems to give slight relief. The act becomes involuntary, and the patient is constantly pressing against the tooth with the opposite jaw, or manipulating it with his fingers. The soreness increases, and the tooth seems longer than its neighbors. This is actually the case, for congestion now exists, and the thickened membrane lifts the tooth from the socket. Mastication now becomes excessively painful, and the jaws are held partially open so as not to touch the tooth. Pressure or movement of the tooth with the fingers gives increased pain. The tooth is slightly loosened, sometimes quite noticeably so. The recumbent position and warmth of the body increase the pain. There is lassitude and a tendency to fever. The tongue is coated and the breath fetid. As the tenderness increases the pain becomes acute at the slightest touch even of the tongue, and the dull, heavy ache is constant. Inflammation is now fully developed, but should the cause be removed it may still terminate in resolution; otherwise suppuration will be the result. The formation of pus is usually indicated by a chill or chilly sensations, and the surrounding soft parts begin to swell. From this time the pain gradually grows less, until suppuration is fairly established, when it ceases. The face is now badly swollen. The cheek is hard and brawny, and the muscles so rigid that the teeth can scarcely be separated a quarter of an inch. The pus having found an outlet either through the alveolus, the canal, or around the tooth, the swelling gradually subsides, and the tooth resumes its functions.

The appearance of the periosteum during irritation is not greatly different from normality. There is slight redness at the apex of the root, and under a glass it presents increased vascularity. But in the later stages the congestion is marked, and even the thickening can be detected readily. The redness does not extend over the whole

root, but is confined to within a short distance of the foramen, showing the local character of the disease.

There is a chronic form of periostitis, so sluggish and unirritating as to attract no attention more than a consciousness of the presence of the tooth and slight discomfort, and yet so persistent as to eventuate in abscess. It may become acute at any time, when the irritation is sufficiently increased.

Diagnosis.—Bearing in mind the symptoms as enumerated above, this disease should be readily recognized. The only difficulty lies in differentiating between the evanescent form of the disease accompanying pulpitis and the acute form which only follows the death of the pulp. They are identical in symptoms and pathology during the early stages. The first is a subordinate lesion, and treatment, to be effectual, must be directed to the pulpitis as the cause to be removed. It rarely ever passes the stage of moderate congestion. The second requires active treatment in an entirely different way. It becomes us, therefore, to discriminate between them.

The symptoms of pulpitis are so marked, and an examination so readily detects living matter in the pulp-chamber or canals, that it would seem to be easy to exclude it from the diagnosis. The prodromic period or stage of irritation is much longer in pulpitis than in periostitis. The former may last from twenty-four hours to two or three weeks, and it is commonly the case that patients when they apply give a history of more or less pain extending over considerable time. In periostitis pain is usually pronounced and continuous after about forty-eight hours, and there has been no history of pain prior to that time except as it has been separated from the present trouble by an interval of two or more weeks of quietude. The history of this *previous* attack is most likely the history of pulpitis. The course of the disease is very different from pulpitis. In periostitis the tooth becomes rapidly more and more *excessively* tender to the touch, and upon tapping with an instrument the pain is acute and severe; while in pulpitis such tapping produces only the effect of tenderness and soreness.

The appearance of the gums in periostitis is at times quite pathognomonic. The color over the affected tooth is much darker than in health, being sometimes almost purple.

In the later stages of the disease its recognition is uncomplicated. The great systemic impression; the heavy, constant, *pounding* character of the pain; the swelling, suppuration, and decline of the symptoms, all point unerringly to this lesion.

Chronic periostitis is not so easily recognized. The only symptom is the slight soreness of the tooth; and this is common to many conditions. If, however, there is no discharge, and the pulp is entirely

dead, there is but little further doubt. If any, it can be definitely settled by cleansing and disinfecting the canals and sealing them up tightly either with gutta-percha or cement. If it is chronic periostitis, that has not reached suppuration or abscess, it will not only bear this treatment but will get well on it.

Treatment.—If the disease is not on the decline, the first indication is to produce an outlet for the escape of putrefactive gases or pus. If there is simply an open cavity, it is not usually difficult to uncover the pulp-chamber or to open the canals with a broach. For the first, the tooth should be steadied by holding between the thumb and finger (if possible) to prevent the pain caused by jarring; and then cutting with spoon-shaped excavators; or, better, if easy of access, by slowly running a round bur in the engine. Should the contents of the cavity be hard, a spear-shaped drill is the quickest way of accomplishing the desired result. If the cavity is not easy of access, there need be no hesitation about opening by the most direct route. This is, in the incisors and cuspids, through the posterior surface; in the upper bicuspids and molars, through the masticating surface; and in the lower bicuspids and molars, through the buccal surface. The instruments used in working upon such a tooth should be *sharp*, so as to cut freely, quickly, and with as little jar as possible. If there is a filling in the tooth through which the opening can be *easily* made, it is good practice to open through that, but not otherwise. Aside from the fact that we are dealing with a very sore tooth, and must therefore make our opening as easy for the patient as possible, the accessibility of the opening for after treatment is to be considered.

If the stoppage is in the canal, it must be reamed out with jewelers' broaches or the Gates-Glidden drill, until a pivot-broach or Donaldson's bristle can be passed to the apex. Being satisfied that there is a free opening,—a fact that is often made patent by the odor of the escaping gas or the contaminations on the examining probe,—the patient can be dismissed with the assurance that the distressing symptoms will abate. *Leave the vent open*, and make an appointment for a time when the acute inflammation shall have subsided.

In all cases when pressure of an opposing tooth gives pain it is to be relieved by inserting something for the adjoining teeth to strike upon, so that the diseased tooth shall have rest. The simplest device for this purpose is a cap of gutta-percha, molded while warm over the neighboring teeth of the lower jaw. Mastication should be avoided and soft food advised.

If the swelling has reached its height and the pain has ceased, or the disease is on the decline, operative interference may not be

wise, because the probability is strong that an opening or sinus is almost formed through the alveolus, and as this facilitates future treatment it should be encouraged by the application of a capsicum bag or plaster over the affected root, between the gum and the cheek, or the gum can be painted with iodine vesicating fluid or oil of mustard. If either of the latter is used the cheek should be protected by placing a bit of oiled silk between the gum and cheek.*

It should be remembered that in upper molars it is nearly always the palatine and in the lower molars the posterior root that is affected by this disease; hence manipulations should have especial reference to them in treating these teeth.

In the first class of cases (those treated by venting) the inflammation will have sufficiently subsided in twenty-four or forty-eight hours, when the patient should be again seen. If the vent was made prior to the formation of pus, the disease is aborted, and the remaining treatment is simple. Cleanse the root-canals thoroughly by wiping them out with cotton on a pivot-broach until they are dry and clean; dress them with thymol dissolved in alcohol, oil of cloves, creasote, or diluted carbolic acid. To do this a very few fibers of cotton are twisted on a pivot broach and the medicament is by this means carried to the canal and pumped into it. Then take a few fibers of cotton and twist them into a rope about the size of floss silk (the latter can be used, although I do not like it as well); moisten this with the antiseptic, and, taking up one end on the root-canal plugger, pass it into the canal fold upon fold until it is packed full. Close the cavity with cotton and sandarac, and allow the dressing to remain for twenty-four hours, or a temporary filling can be put into the cavity and allowed to remain for two or three weeks. The latter method is an excellent one when the time can be allowed, for it tests the cure of the case. If, however, after the dressing has been in the tooth twenty-four hours, and there is no pus or odor on its removal, a cure has been effected, and the root is in condition for permanent filling.

If the vent was not made until after pus was formed, as evidenced by the swelling, the cessation of pain, or the appearance of pus at the vent, an abscess has been established, and its treatment is the

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* A good method of applying remedies of this class, including oil of capsicum, is as follows: Take two pieces of heavy blotting paper; spread one side of each with warm bees-wax, containing a small portion of balsam of fir, or if that is inconvenient use bees-wax alone. The wax should not be melted, but simply warm enough to spread easily. Press the two waxed surfaces together, and it is ready. To use it, cut from the double sheet such a piece as is desired, and upon one side place a drop of the remedy. The wax will prevent penetration, and the dry paper will hold it in place. The pad should be a little larger than the drop of medicine will cover. This is cheap and effective.

treatment of that disease. This is also true of cases left to force their own vent through the alveolus.

In chronic periostitis it is only necessary to thoroughly cleanse the canals and fill them with cotton-rope saturated with thymol in alcohol, oil of cloves, creasote, or carbolic acid, or other antiseptic, for one or two weeks. Or, if necessary, they can be filled permanently with oxychloride of zinc. If the latter, there must be a certainty that there is no suppuration. These cases do not often come to us before they have passed into chronic abscess, so that this precaution becomes doubly necessary.

(To be continued.)

PROTRUDING TEETH.—THE LIMIT OF ANCHORAGE IN BICUSPIDS AND MOLARS.

BY J. N. FARRAR, M.D., D.D.S., NEW YORK CITY.

XXVIII.

(Continued from page 169.)

Caution to be Observed in Correcting Protruding Front Teeth.

A knowledge of the power of anchorage resistance is of so much importance to the regulator of teeth by this system, that a few words regarding it at this time may be appropriate. In the spreading of the dental arch the opposite teeth are mutual supports, acting favorably upon each other, and as anchorages they are always to be relied upon for any and all movements of this variety.

Fig. 201.

So, also, in cases where the side teeth are jumbled together,—as, for instance, where the laterals, cuspids, and bicuspids are out of place, the posterior teeth afford sufficient anchorage to effect their easy correction.

The correction of deformity caused by abnormal protrusion of the six upper front teeth sometimes, however, requires a greater degree of anchorage than the posterior teeth afford, thus requiring great judgment and care; for, as the condition of the alveolar process varies at different ages and in different people of the same age, it necessarily follows that the value of posterior teeth as anchorage

must also vary. In other words, the anchorage resistance of teeth has a limit inside of which oral apparatus may be used with great success; outside of which caution, at least, is necessary. This limit, however, depends somewhat upon the point of attachment of the apparatus; for, when the draught is made from the necks of the teeth, the degree of anchorage resistance is greater than when from near the grinding surfaces; as in the latter position the crown acts as a lever upon the socket tissues.

Fig. 202.

Figs. 201, 202, and 203 are outside views of three modifications of Farrar's bridle apparatus for correcting deformities caused by protruding front teeth.

According to my experience the degree of anchorage resistance of bicuspids and molars may be approximately stated as follows:

Relative Anchorage Resistance of Teeth.

Fig. 203.

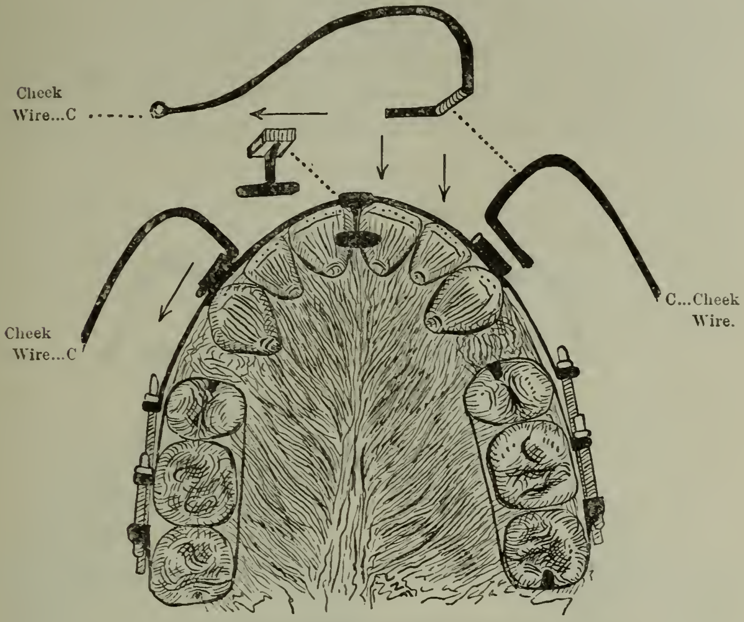
1st. The anchorage resistance of two bicuspids is sufficient to move one cuspid; but as the resistance of both is nearly equal, they are equally affected, and in approaching each other by means of a clamp-band will meet about half way.

2d. The anchorage resistance of one molar is sufficient to move the first bicuspid into the place of a missing second bicuspid.

3d. The anchorage resistance of one bicuspid and one molar is sufficient to move one cuspid and one lateral incisor.

4th. Assuming that the first bicuspid is extracted to make room, the anchorage resistance of the second bicuspid and two molars

FIG. 204.



Inside view of Farrar's Bridle Apparatus.

(fully developed) is generally sufficient to move the cuspid back against the second bicuspid, and is sufficient afterward to draw

FIG. 207.

FIG. 206.

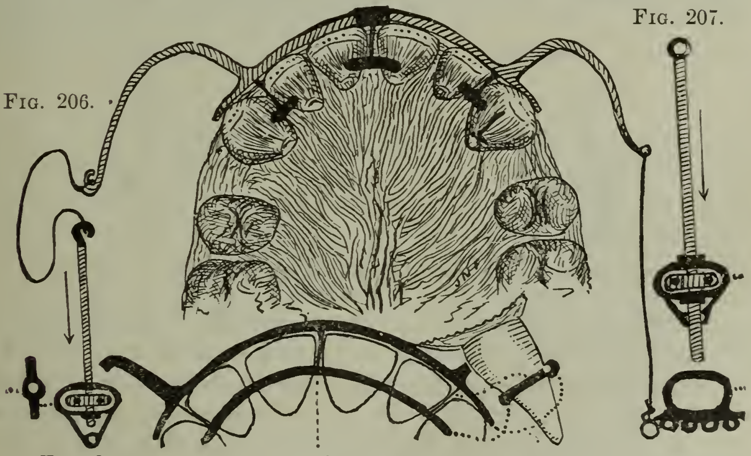
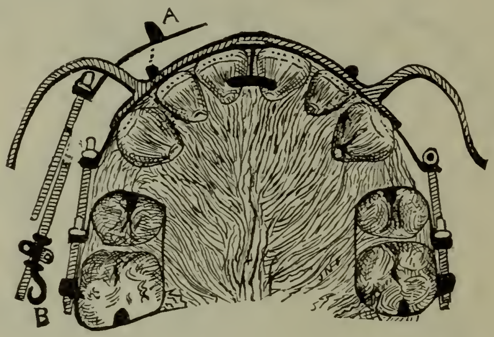


FIG. 208. FIG. 205.

back the contiguous lateral incisor and one central about one-eighth of an inch, sometimes more; but this cannot be relied upon.

By the above it will be seen that, in order to correct the deformity under consideration by means of inside apparatus, the operation should not be commenced until the patient is about the age of twelve or thirteen years; for at an earlier age the anchorage resistance is liable to be insufficient, and these posterior teeth will be liable to move forward and meet the front teeth moving in the opposite direction before they have reached the desired position, thus rendering the completion of the operation with apparatus depending

FIG. 209.



solely upon bicuspids and molars for anchorage difficult if not impossible.

Should the anchor teeth, through carelessness or lack of experience, be tilted or moved forward too much, the further use of such teeth for anchorage should be postponed for several months, perhaps a year, when they will generally become sufficiently reset to complete

FIG. 210.

FIG. 211.

Side views showing the Bearings of the T and the Hook on the Front Teeth.

the operation, if conducted with care. Instead of postponement, I prefer, however, to make such cases exceptions to the rule, and push the operation on to completion by the aid of the same apparatus modified, making the back of the head the place of anchorage, and using the portion on the posterior teeth as a retaining fixture only, as illustrated by Figs. 201, 202, 204.

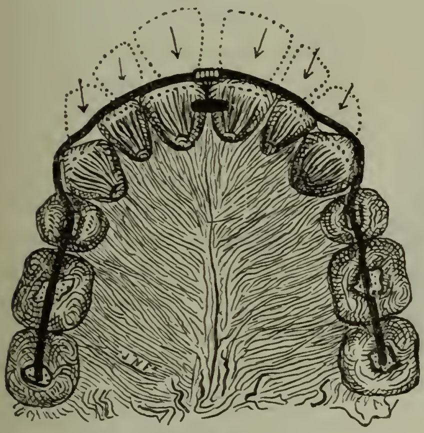
By this apparatus (which I shall presently explain) the advance-

ment so far made by the teeth may be retained, as the case progresses, by taking up the slack in the inside apparatus from day to day, thus insuring the case against accidents such as would occur should the outside portion of the apparatus slip off or get out of order. This combination also permits the safe removal of the outside portion and the temporary suspension of the operation during school hours.

Bridle Apparatus for Correcting Protruding Front Teeth.

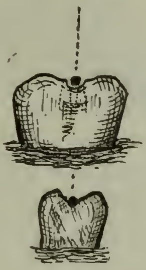
The details of construction of this apparatus are as follows: A gold strap made of rolled wire, having a smooth nut on each end, is bent to conform with the anterior surfaces of the four or six front teeth, and fastened by means of screws to clamp-bands on the posterior teeth, as shown in Fig. 204. To prevent this front band from

Fig. 212.



Retaining Fixture.

Fig. 213.



slipping upward to the gum, troughs have been tried, but they collect food and injure the teeth. I use one or more T pieces, made to fit between the teeth, soldered to the band or to ferrules sliding on the band, as used on some of my similar band apparatus of ten years ago (see Figs. 204-210), or broad plate hooks (Fig. 211). Another plan of attaining this end is by the use of a round wire resting upon the lingual surfaces of the teeth, connected in the same way to the front band, as shown in Fig. 205. The nearer the cutting edges of the teeth these front wires rest, the less power it requires to move the teeth.

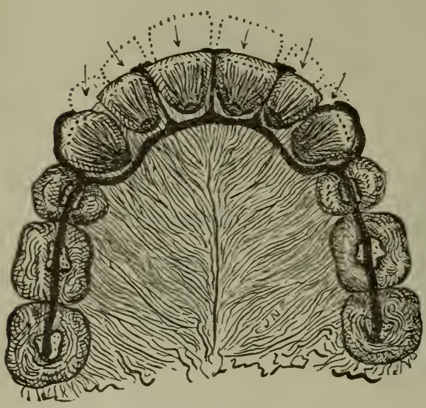
The front band is connected with the outside apparatus by means of cylindrical or angular ferrules or staples soldered to it at points opposite the space between the laterals and cuspids. Through these ferrules or staples, which are at a sufficient distance from the corners

of the mouth to prevent drooling, are hooked bent cheek-wires, C, C, C (about No. 12), which project forward and outward, thence pointing toward the ears on a line with the front band, Fig. 202. To prevent the falling over of this curved cheek-wire, one side of the ferrule portion may be filed flat, and the ferrule shaped to correspond by a blow from a hammer; but this is seldom necessary.

In some cases, where detachment of the two parts is of no consideration, the cheek-wires may be soldered directly to the front band-piece, the retaining portion of the inside apparatus being dispensed with, Fig. 206, or double band, as shown in Fig. 209. The outer extremities of these cheek-wires are screw-cut for drag-nuts, one modification of which is illustrated by Figs. 207, 208, and by B, 209.

These wires may be in two or more pieces, but as this causes a pressure upon the cheek, which may crowd upon the anchor apparatus inside of the mouth, it is much better to make the cheek-wire in one piece, which if bent properly will arch from the teeth to the ear-ring without being in contact with the cheek. In fact, my experience teaches me that the latter is much the better form. The screw extends through holes in opposite sides of a small ring, which ring is caught on one of several hooks, soldered to a much larger ring, extending around the ear of the patient, Figs. 201 to 203. This larger ring (which is necessary to prevent interference with the ear) is fastened to inelastic straps extending around the back of the head, and held in place by other straps as shown. The lower straps and ear-rings constitute the anchorage apparatus. The ear-rings should be about two and a half by three inches in diameter, underlaid by soft leather or felt rings about one-fourth to one-half of an inch wide, to serve as cushions to protect the skin. In order to have these rings rest in the proper places around the ears, and the harness bear equally, to prevent headache, the several straps should be made capable of being tightened or loosened independently by means of buckles.

Fig. 214.



Retaining Fixture.

When the apparatus is in position the friends of the patient are instructed to tighten the posterior bands or to turn the nuts within the smaller rings daily. The patient is advised to call at the office

once or twice per week, when, if the position of the teeth has changed sufficiently to render the front band liable to slip off, the direction of the draught should be changed by raising the nut-ring from a lower hook on the ear-ring to one higher.

Before commencing these operations it is important that every feature of the case be considered, for if the bridle apparatus must be finally resorted to, in order to attain success, it is better to do it at first when the posterior teeth stand in their best position to serve as anchorages for retaining apparatus; for, should they be tilted forward by trying to reduce the deformity solely by them, their usefulness is impared for anchorages, and it is often difficult to firmly fix retaining apparatus upon them.

As a general rule, where the front upper teeth are in an arch approximating the proper size, and where there is not ample space occasioned by missing teeth or by separation of the teeth, I think it is better to "take the bull by the horns," extract a bicuspid on one or both sides, and immediately apply the bridle apparatus, rather than to dally along on uncertainties. But whoever undertakes these operations for the first time should understand that these cases require considerable bold skill, and carefulness about the bearings of the back-straps.

Since devising this apparatus I have been able to regulate protruding front teeth in all cases, before as well as after the development of the second molar; and if it is made properly and delicately it operates easily, accurately, and is neither uncomfortable nor very unsightly.*

Figs. 212 and 214 illustrate two of my methods of retaining such teeth in their new positions. They consist in fastening gold wire into cavities in the bicuspids and molars with amalgam, as shown. As amalgam hardens slowly, the wires should first be set with phosphate of zinc, replacing only one or two plugs with the amalgam at each subsequent sitting until all are changed. Fig. 213 illustrates the relation of the wires to the sulci of the teeth.

A very convenient plan, suggested by an office assistant, of retaining such teeth is by the use of a detachable device secured to

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* This apparatus resembles somewhat a fixture described by Dr. Kingsley, but differs widely in the object, philosophy of construction, and the character of force. The latter has for its object to depress protruding teeth in their sockets; the former to move teeth posteriorly. One is constructed with a leather skull cap and *elastics* for *continued force* on a line from the cutting edges of the front teeth to the crown of the head, or nearly *in line of the long axis of the teeth;* the other is a skeleton bridle constructed of woven *inelastic* material, connected with the teeth by means of screws, for the purpose of *intermittent pressure on a line at right angles with the long axis of the front teeth*, directed towards the back portion of the head, as illustrated by Fig. 202.

the teeth by clasps, fastened directly to such wires. As such devices are easily bent out of shape, it is often better to fasten the clasps to U-shaped plates of gold or hard rubber, to which such retaining wires as these may be attached. Of course these should be kept clean.

OBTURATORS.

BY P. J. FRIEDRICHS, D.D.S., NEW ORLEANS, LA.

(Read before the New Orleans State Dental Association, March, 1886.)

In his excellent work on oral deformities Dr. Kingsley says, "All apparatus adapted to the roof of the mouth, whether forward or back to the hard palate or soft palate, may properly be designated as *artificial palates.* But, as such instruments may be divided into two distinct classes, operated upon different principles, and applied in the main to entirely different cases, without the possibility of interchange of principle, I therefore denominate the one an *obturator* and the other an *artificial velum.* An obturator, according to this distinction, is a stopper, plug, or cover; hard, non-elastic, and stationary; fitted to an opening with a well-defined border or outline, and shutting off the passage. Such instruments are of nearly universal application to perforations of the hard or soft palate resulting from accident or disease, but they are rarely applicable to a congenital fissure of the velum. An artificial velum is not a stationary stopper, but an elastic, movable valve, under the control of the surrounding and adjacent muscles, closing or opening the passages at will, and is applicable especially to congenital fissures, occasionally where the soft palate has been destroyed, but *never to perforations of either the hard or soft palate.*"

This is sufficiently definite, and the distinction made between a simple obturator and an artificial velum is eminently proper; and yet it leaves us in doubt what kind of material should be used in case of a perforation of the soft palate. We are told we must never use an elastic movable valve or cover in perforations of either the hard or soft palate. With due deference to Dr. Kingsley's knowledge in all matters pertaining to the construction and application of obturators, I am constrained to differ with him in the position he has taken, and say that, for perforations of the soft palate resulting from accident or disease, nothing better can be employed than a material which is *soft, pliable,* and *elastic.*

When we take into consideration the peculiar action and motion of the velum palati, it will be obvious that such a material is a *sine qua non* for the purpose. When the soft palate is elevated to its fullest extent its surface appearance forms an irregular concavity. How are we to close a perforation in this irregular shaped and mov-

able curtain? It cannot be done successfully with a hard material. We must use something which will conform and adapt itself to the changes which are occasioned by the movements of the palate. These conditions can only be fulfilled by a material that is soft, flexible, and elastic in its nature; and, furthermore, it is absolutely requisite that the material used be *non-irritating*, because in acquired lesions of the soft palate this membrane is peculiarly susceptible to irritation, and therefore any undue pressure or irritation may cause serious inflammation and thwart our efforts to benefit the patient.

On page 250 of the previously mentioned work an illustration is given of an obturator for perforation of the soft palate. Dr. Kingsley says, "Figure 172 represents a more complicated obturator, adapted to an opening in the soft palate." In this case the obturator is made of vulcanite, and passes through the opening, its flange resting on the superior surface of the natural palate to prevent its dropping out of the opening. Here we see a method employed similar to that which was in use three hundred years ago, and of which he says, "The principal objection is that it would prevent a final closing of the aperture from natural causes; experience having shown that in many cases where the aperture is only bridged over healthy granulations form, and ultimately the gap is completely filled."

Bourdet, writing in 1756, says, "Before considering the cicatrized perforations of the palate as being of a nature incapable of diminishing in diameter, practitioners should satisfy themselves thoroughly and beyond a doubt that such is the case. We do not think that this condition of permanency can exist, for positive facts attest the contrary, and as holes made in the cranium with a trepan close almost entirely, in like manner those of the palate constantly diminish."

Mr. Snell, an English author of some importance, demonstrated this fact, and Dr. Kingsley says that this pathological fact being now confirmed by fifty years of experience, added to Snell's, determines the true principle upon which all obturators for simple perforations should be based.

If to simply cover the aperture is the true principle (and beyond a doubt it is), the mechanism in figure 172 is a direct violation of this principle, because an obturator passing through and beyond the opening would preclude the possibility of a closing ever taking place.

A case of ulcerative lesion of the soft palate was recently treated by me. The patient, a lady about forty-eight years of age, apparently in good health, was sent to me by her physician for the purpose of having an obturator made. I know very little of the previous history of this case. The lady told me that this opening had been

a source of extreme annoyance and trouble to her; that when she went to the table for her meals she was compelled to provide herself with a number of napkins, for the purpose of wiping away the accumulations of liquids and solids which would be forced out through the nostrils during the process of mastication; in short, she could neither eat nor drink with any comfort or satisfaction. Her speech was quite indistinct, though in this regard she did not complain, as she could make herself understood.

Upon examination, I found the aperture situated one-quarter of an inch in front of the uvula, and in size about that of a five-cent piece, its largest diameter being divided by the median line. The patient was at the time wearing a partial plate of vulcanite. This plate fitted poorly, but nevertheless I concluded to attach an obturator to it temporarily. The attachment consisted of a strip of 18-carat gold plate, one-quarter of an inch in width and long enough to go beyond the aperture. Rolling out this strip of gold from gauge 26 to 33 gave to it a springiness sufficient to follow the movements of the palate. I next took the thickest rubber dam I could find and cut a disk of sufficient size to more than cover the aperture. This disk was then riveted to the gold strip; this strip with the disk attached was then permanently fastened to the rubber plate, and so adjusted that the rubber disk would cover the aperture. This arrangement proved a perfect success, keeping the aperture closed during the various movements of the palate and affording all the relief that the patient could desire.

After the lapse of a week I took an impression for a new plate. I found that the rubber disk was beginning to become softened and losing its elasticity, so that the edge would roll and curl upon itself, thus imperfectly covering the perforation. I saw that it would be necessary to change the disk as occasion required, and this could not be readily done, so long as it was riveted. I therefore devised a method of fastening by which a new disk could be adjusted in a few minutes. This was accomplished by cutting two diagonal slots on each edge of the gold strip, converging to a common center and to a depth so as to leave about an eighth of an inch in width between the incomplete V-shapes formed by the slots. The rubber disk is punctured in its center and passed through the slots, and is thus securely held *in situ*.

This device answers the purpose admirably, and the disk can be changed whenever required. I found that a change of disks had to be made once in every three or four weeks. The obturator has now been worn four months, and I find that the opening has been reduced to such an extent that the lady can now almost do without the appliance, the aperture being so nearly closed. I have every reason

to believe that in due course of time a natural closure will take place.

My conclusions as to what is requisite in lesions of the soft palate are:

1. An attachment that will follow the movements of the soft palate without causing any irritation.

2. A covering material which is non-irritating, soft, flexible, and elastic, and this adjusted to the attachment so as to perfectly cover the perforation.

Perforations of the hard palate may be treated by very simple methods. A plate made of metal or the vegetable bases will answer every purpose and accomplish desired ends. When the arch still retains some of the teeth, the obturator may be attached to them by means of clasps, and nothing further is necessary but to make the plate accurate, neat, and delicate, so that it may be worn with comfort.

PROCEEDINGS OF DENTAL SOCIETIES.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting, Tuesday evening, April 13, 1886, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. E. A. Bogue, in the chair.

Incidents of Office Practice.

Dr. George S. Allan. I would like to call your attention to a little appliance which I have recently used to correct a condition rather frequently met with in the mouths of our patients. In the mouth to which I refer the lower sixth-year molars had been extracted some time after the eruption of the twelfth-year molars, and as a consequence the teeth last named had tipped forward, their posterior edges being much elongated and furnishing the only points for articulation with the upper teeth. The mouth was, therefore, propped open by this mal-articulation, there being nearly three-eighths of an inch between the front teeth. The patient was seventeen years of age. The wisdom-teeth had not erupted, and the upper sixth-year molars were in position.

A metal cap was fitted over each of the offending teeth, a lever about half an inch long being soldered to the posterior edge of each cap, and extending backwards so that when the jaws were closed the occlusion and consequent pressure was upon the end of the lever. Care was taken that the pressure should not be too great, and the

patient experienced but little discomfort, his mastication not being seriously interfered with.

After the caps had been worn some weeks they were removed to enable me to see what progress, if any, had been made, and I was pleased to find that the change in the position of the twelfth-year molars had been such that the front teeth were then separated only one-sixteenth of an inch when the jaws were closed. That examination was made last week, and I feel perfectly satisfied that when the caps have been worn a few weeks longer the molars will be tipped toward their normal position sufficiently to make the occlusion perfect all the way around.

Dr. N. W. Kingsley. Do you know whether the space that you gained in closing the jaws in front was due to the tipping back of the molars or to their having been actually driven into the jaw? I have seen within forty-eight hours a case where I had put a peg between a plate and a front tooth; the peg placed so that when the lower teeth impinged against the plate the tendency would be to crowd out and turn the central incisor; but, instead of seeing that incisor turned, I saw it shortened at least one-eighth of the length of the crown. Instead of turning, it has been actually driven into the jaw. Are you certain that biting on the lever, as you have described, has not tipped the cap and kept it loose? May it not be that the upper teeth coming down on the lever and cap may have driven the teeth down?

Dr. Allan. I should have stated before that these caps were cemented to the teeth with zinc phosphate, and therefore were securely anchored. The movement was a genuine tipping backward of the teeth in the jaw, as the posterior cusps were depressed, the anterior cusps elevated, and the space between the molars and the second bicuspids increased.

Dr. Kingsley. I am glad to know it. I have wanted to do such things, and found I had cheated myself when I thought I had. I am glad some one else has succeeded. Possibly I shall be encouraged to try it again.

The President. If there is nothing more under the head of "Incidents," we will listen to the reading of a paper by Dr. Allan.

Dr. George S. Allan read a paper on

Caries of the Teeth: its Prevention and Treatment,

illustrated by views of the actual specimens thrown upon the screen by the projection microscope.

Dr. Allan. Mr. President and Gentlemen: The subject which I have the honor of presenting to you this evening is the most time-

worn of any that pertains to our specialty, and I am well aware that you are almost weary of the word "caries." We must continue to study the subject, however, even if we love it not, for justice to our patients demands that we keep fully abreast of the times in all that will add to our skill or aid us in practice, and it is equally our duty to freely give one another any thoughts or principles that we may have found useful.

On this latter idea I make my plea with you this evening, and have thought that in placing before you a few of the principles that have guided me in my daily work I might interest you, even if I fail to add to your knowledge.

When a boy at school I was told that "the higher I aimed the higher my arrow would go," and later in life the same thought was conveyed by the phrase, "Look well to ideals and results will take care of themselves."

He who has but a crude idea of what a perfect tooth in a healthy mouth is cannot be expected to bring his operations up to the highest standard. Of course, we can only approximate the perfect standard, but we can do our best, and the first step is to have a clear conception of what the finished model looks like. We will then be in the best position to detect any variations in or deviations from the same, and to take the shortest path to our goal. What has all this to do with "caries?" Let us see. Have any of you ever seen a perfect tooth in a perfectly healthy mouth? I assure you it is a very difficult thing to find, and we can never be sure that we have succeeded, as an examination with the microscope would necessarily be the final test.

We all know how fair and beautiful some teeth look for years, and then, when some change of environment comes, how the weak spots manifest themselves and the tooth crumbles away, leaving us to wonder why we did not detect the point or points of danger sooner. A healthy mouth, so far as the gums, mucous membrane, secretions, etc., are concerned, is far more common than an ideally perfect tooth. I have tried my best to find a section of such a tooth, but have yet to obtain it. You will see quite a number of sections projected on the screen shortly—but you will not see the ideal one.

When I was in Cuba a month or two since I was obliged to wait some time at a station, and amused myself examining the teeth of quite a number of boys who were idling in the vicinity and asking people for money. They were boys of the poorer class, from twelve to sixteen years of age, and of all colors, from black to almost white. Their teeth, although showing no evidence of the slightest care or attention, were in almost perfect condition, and it was certainly one of the most marvelous exhibitions from a dentist's stand-point that I have ever seen.

I now ask your attention to consider briefly what the so-called caries of the teeth is.

The one and only point that we can hold to without at once arousing opposition is that caries always begins on the outside of the tooth, and cannot by any possibility commence within the structure. This much we *all* accept. Another point we are almost agreed upon, but not quite, viz., that caries is the disintegration or breaking-down of the tooth-substance by the solvent action of acids on the lime-salts of which it is mostly composed. That this acid theory is not universally accepted we have evidence enough at hand. A considerable number still believe that caries of the teeth is a disease having a constitutional origin, and therefore amenable to constitutional treatment. Once outside of these two accepted truths, and we find ourselves on a sea of troubled waters. Opinions differ, questions multiply, and argument becomes more bitter and pointed as the evidence reaches the domain of doubt and uncertainty.

The two theories that have the most prominence and weight I will briefly call your attention to, for each in turn has a direct bearing on the subject we are considering. The first is the bacteria theory, which aims to account in a large measure for the acids that are the immediate cause of caries of the teeth. The bacteria theory is not a modern one, but this present age has seen it for the first time placed on a scientific basis, with its problematical and speculative character removed. No one can read carefully the monograph of Dr. W. D. Miller, of Berlin, "Fermentation in the Human Mouth: Its Relation to Caries of the Teeth," without being impressed with the great patience, care, and technical skill with which he has worked out his conclusions and made complete the chain of evidence. The profession owes much to Dr. Miller for having placed this theory on so solid a basis. Without going into details, let us see what has been proven.

1st. That fungi—bacteria—constantly exist in the mouth, and especially in and around carious teeth, and as a resultant of their growth and increase a ferment acid—lactic—is produced.

2d. That these fungi can be isolated, their specific character determined, and their life-history studied.

3d. That artificial caries can be produced by placing teeth in a "pure cultus" of these fungi, which cannot be distinguished microscopically from natural caries.

4th. That this "organized ferment"—fungi—grows and reproduces itself, though excluded from air and oxygen, the other conditions being favorable; and therefore a water and air-tight filling alone is not at all times an absolutely sure preventive of caries.

The chemico-vital theory, which lays great stress on the resisting

force of the vital powers of the tooth, is also an old one. The great resisting force of living tooth-substance to the active agents producing caries is almost universally acknowledged. How this force acts is quite another question.

Much has been said in our societies and magazines lately on the so-called "bioplasson doctrine," a doctrine which claims that the life-giving and developing powers of protoplasm are located in a fibrous network or reticulum within the mass. Not satisfied with this, it extends the reticulum into Beale's so-called "formed material" and throughout the body. In fact, in its ultimate analysis it entirely obliterates all former ideas about protoplasm. Had the believers in this new doctrine confined the reticulum to the protoplasmic corpuscle as we see it in the white blood-corpuscle or the pus-corpuscle, it would not have attracted great attention, and many would have given it credence, but the doctrine as it is has been criticised sharply. Outside of our profession it has been noticed but little, and that little has been far from favorable. At this time I do not care to take up the question on its merits, and I allude to it now for but two reasons: First, because it makes the enamel a living tissue,—a statement which I believe to be utterly fallacious; second, I am unwilling to have all dentists go on record as accepting it. Nor would I have the Odontological Society indorse it unanimously.

Dr. Bödecker's statement that there is a stellate protoplasmic reticulum in the inter-prismatic substance of the enamel deserves a passing notice. Dr. Bodecker claims to have demonstrated his position, and states that he has specimens (his own handiwork) the evidence of which cannot be questioned. Said specimens I have not seen, nor do I know of any careful, educated histologist who has had that privilege, other than those who work with the doctor. I do know that many painstaking and skilled workers have repeated Dr. Bödecker's process with results not at all confirmatory. Negative evidence this, I admit, but far from worthless when we consider the character and fitness of the men who undertook the work. To outsiders the theory seems most improbable and lacking in proof. A study of the developing tooth affords at best but negative evidence, and a morphological or chemical examination most positively opposes it. The histological evidence seems inconclusive, with the chances all in favor of time proving that errors in technique and interpretation have misled the searchers after truth.

I now wish to call your attention to several peculiarities in the different dental tissues, and to suggest a few practical points or methods of practice which may be adopted because of them. Most of the conditions to which I shall refer will be noticed in the views of the actual specimens when they appear upon the screen, which illustra-

tions will probably make them plainer than any words that I can select to describe them.

All evidence proves that enamel is a crystalline substance and not homogeneous, the prisms and the cement-substance between the prisms being of unequal density and brittleness, so that it is very difficult to cut it and leave a smooth, even margin. If it were homogeneous, even though of the most brittle character, it would be easier to cut that line smooth than it is under existing conditions. Take your instrument and cut through materials of different degrees of hardness, and you find that the difficulty in getting a smooth margin is very great. I find that the best way to cut these enamel margins is with a sharp bur revolving at a high rate of speed. This I have proved to my own satisfaction by preparing cavities in teeth out of the mouth and examining them under a magnifying glass. I found that with my hand-instrument it was almost impossible to get the margins perfect.

I am of the opinion that practitioners generally have not paid

Fig. 1.

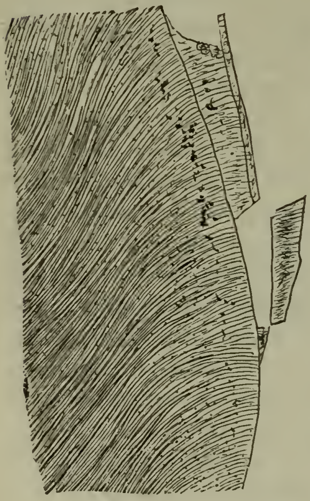


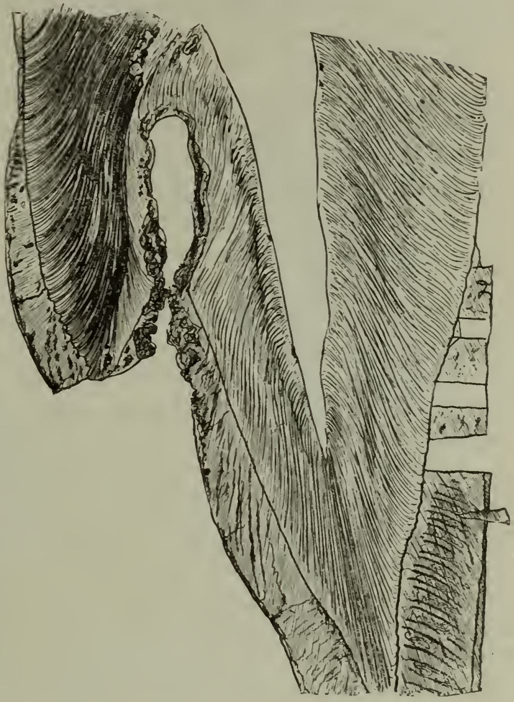
Fig. 2.

sufficient attention to the fact that the union of the enamel and dentine is a mechanical rather than a vital one. The study of tooth-development proves that the union of these two structures must necessarily be mechanical, as they are separately formed and originate from cells of entirely different character. In cutting specimens the knife is very apt to separate the two (Fig. 1), the fracture always being at the line of union; for neither the enamel nor dentine breaks readily in its substance. The mechanical union referred to is, however, a dual one, for, besides the "dovetail" formed by the junction of the roughened surfaces of enamel and dentine and a slight interchange of fibers, they are cemented by a material very like the interprismatic substance of enamel.

My observation and experience have proved to my satisfaction that enamel will separate from dead dentine more easily than from living dentine.

Another point that I wish to draw your attention to is that in excavating great care should be taken not to cut off the dentinal tubules nearer the pulp than is absolutely necessary. All the retaining-points or grooves should be formed as near the line of the enamel as possible, for if the dentinal tubules are cut near the pulp the zone of dentine surrounding the filling will be a zone of dead dentine, and much more liable to decay than if it were living. Among the specimens to be shown you this evening is an interesting one from Dr. Atkinson's collection, which will illustrate this point, as the undercuts of the cavity shown were made very deep therein, cutting off all connection between the pulp and much of the dentine surrounding the filling,—one effect of which is shown in the different color of the isolated portion (Fig. 2). The dentinal fibrils once cut off from the pulp, *die*, then decompose and become a source of danger, for dentine filled with putrescent matter must certainly be more liable to decay than if naturally nourished.

FIG. 3.



The age of the patient has much to do with this, the danger being greatest in very young teeth, and almost *nil* in those of old age, where the tubules are for the greater part filled with a secondary deposit. Caries in enamel and dentine operates, as a rule, in opposite ways. In the first breaking down of the enamel an acid acts upon the substance between the prisms, as can be readily proved by taking the débris that is in an old cavity, mixing it with a weak solution of glycerin and alcohol, and placing it under the micro-

scope. You will find enamel-prisms, but no interprismatic substance. The enamel is not broken down in an amorphous condition until long after the prisms have been separated from each other; whereas caries of the dentine almost always, where an acid has penetrated the tubuli, commences its ravages from the interior of the tubules and works outwards; the first caliber of the tubuli is enlarged, and then one or more coalesce.

If we were asked what kind of a cavity we could fill with the most certainty, so that there would be no decay afterwards, I think we would all say, "Let me make the cavity in perfectly healthy tooth-substance." No matter how small a cavity of decay may be, the zone of affected tooth-substance will extend far beyond our excavation. We never, as a rule, cut down into substance that has not been somewhat affected by the inroads of acids. It is for that reason that I have always advocated filling the smallest possible cavities. As soon as there is a break that we can detect with our instrument, we may be sure there is a zone of affected tooth-substance extending away beyond that point (Fig. 3). I have an interesting specimen showing Magitot's zone of affected dentine surrounding the beginning of caries in the pit of a molar. Magitot claims that the tubuli are filled with a sort of secondary dentine that becomes solidified thereby closing them. If Magitot is right, then Dr. Miller in his theory of bacteria is wrong, for if these tubuli become closed by the action of advancing caries they could not be filled with bacteria, nor could they become enlarged by the action of such contents. I do not know of any histologists other than Magitot who cling to that theory, and I have yet to examine any specimen where I could clearly demonstrate that these terminal points of the tubules have been solidified.

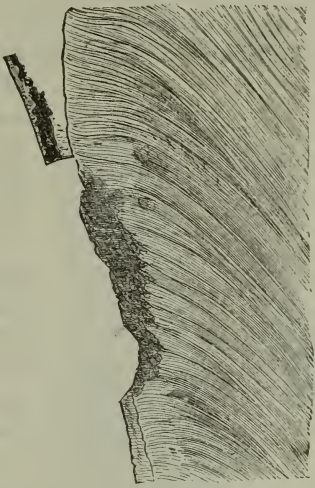
In my further reference to the treatment of caries, allow me now to call your attention to the neck of the tooth where the enamel stops (Fig. 4), and to emphatically assert that, in my opinion, it is a point of great danger, for several reasons, and deserving of the most careful and thoughtful treatment. Normally the cementum slightly overlaps the enamel, but this portion of the tooth is not constant in character.

Often the two structures do not quite join, and a little ring of dentine is left exposed as a consequence. This condition causes the tooth to be rough and uneven (Fig. 5), a groove resulting from the failure of enamel and cementum to join, while the normal tooth is smooth at this point, the junction of the two structures making a continuous and almost straight line. It is really astonishing to find so large a percentage of mouths containing teeth suffering from this cause, and its disadvantages are many. As you well know, the gum does not adhere

to the tooth until you get to the line of the cementum. It is entirely a union between the cementum and the gum, and *never* between the gum and enamel. It is very difficult to keep the teeth clean when in this condition, and the inequalities mentioned invite deposits of tartar, welcome decay, and irritate the margins of the gum, which show a tendency to recede, as they always do when greeted by a rough surface. I would lay great stress on this marginal appear-

Fig. 4.

Fig. 5.



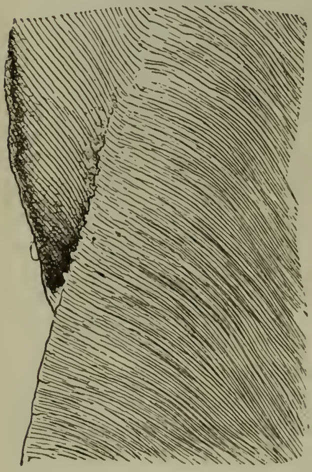
ance, on account of its being the common seat of caries between the teeth, and also because where you have a recession of the gums it is often caused by this uneven, rough character of the neck of the tooth. Since my attention was first attracted to it, I have made it almost a daily task to take a fine, sharp instrument and press it up under the gum, to see if I could find a perfect margin, and it is very seldom that I do. Where there is a slight recession of the gums, I find that by polishing off this margin, and as far as possible producing a continuous, even surface, the recession can be arrested. I do not use a powder there, for I think it is unnecessary. A fine, rounded-edged excavator will make that margin more perfect than it can be made by any other means that I know of; and I am quite certain that where that is used carefully and thoroughly the recession of the gums that comes from the irritating effect referred to can be arrested if not entirely stopped.

It has been suggested that this rough condition of the neck of the

tooth is caused by the action of corrosive agents; but I feel sure that such margins would not result from the agents suggested, and my study of the subject causes me to believe that said condition is a defect present when the teeth are erupted. Therefore, while the *ideal* tooth, as regards its ability to ward off deteriorating influences, would present a smooth and almost straight line at this point, I must admit that the *normal* tooth is apt to be far removed from our *ideal* (Fig. 6).

The specimens shown this evening were prepared in the usual way by being immersed in a weak solution of chromic acid, cut with a microtome and mounted in benzole balsam. These are not exaggerated cases, but were taken at random, and do not illustrate the imperfections referred to as well as though specimens had been selected with more care and trouble.

Fig 6.



And now, in closing, I would like to make a suggestion in regard to the selection of filling materials, and beg that you will give the question the benefit of your most earnest consideration. In selecting the filling for any cavity, eliminate the *cavity* from your problem. Imagine that it is already cared for with an ideal filling; one that neither contracts nor expands; that is not acted upon by any of the fluids of the mouth or the forces of mastication, and one that you can place in the cavity without breaking or chipping its edges. Now ask yourself how long it will be, with such a filling in position,—taking into consideration the environments and conditions as they exist, or are likely to exist, and the probable good care or neglect of the tooth by the patient,—before caries attacks the tooth? The answer to this question will determine the sort of filling to be used. It would be folly to fill a cavity with a material that would last twenty years, if the walls of the tooth are certain, because of their frail condition, to break away in a few months, unless the more durable filling can be inserted with as little danger to the frail edges and with the probability of increasing the chances of longevity. Even then you will take into consideration the facility with which, if necessary, any certain filling could be removed. I thank you, gentlemen, for your kind attention.

The President. On account of the lateness of the hour, it will be

necessary to postpone the discussion of Dr. Allan's paper until the next meeting. We are greatly indebted to Dr. Allan for his valuable contribution.

Adjourned. S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Tuesday Evening, February 2, 1886, in the rooms of The S. S. White Dental Manufacturing Co., corner of Broadway and Thirty-second street.

The president, Dr. William Carr, in the chair.

Dr. John Allen having resigned active membership in the society, was elected an honorary member, and in response to a call from the president made the following address:

Dr. Allen. Mr. President, I am wholly unprepared to make any remarks, as I did not know that this action would be taken this evening. But when I look around me and contrast the difference between the present and the time when I came into the profession, the progress that has been made seems very remarkable. I can say with considerable confidence that there are more dentists present at this meeting than there were in the whole Mississippi Valley when I commenced practice over, fifty years ago. There has been a gradual and marked improvement, and a progressing onward, onward, and onward all the time since then. My old preceptor was Dr. James Harris, a brother of Dr. Chapin A. Harris, of Baltimore; I was with him, after going through my medical studies, mostly with my father, until I commenced practice on my own account; and ever since my earliest connection with the profession the march of improvement in it has been steadily onward. But there is yet room for much more improvement. We have not yet reached the high point that ought to be attained; but I trust that the energy, the force of character, the education, and the earnestness which now characterize our profession will continue to carry it onward and upward to its full development. Whether I shall live to see that I do not know. I have seen very great advances in the profession since I came into it. I could describe the various modes of operating that were in use fifty years ago, and contrast them with the greatly improved methods with which you are all familiar in this day, but it is not worth while to take up your time. I thank you, gentlemen, for the honorable position in which you have placed me this evening.

Dr. C. F. W. Bödecker, chairman of the Clinic Committee, reported as follows:

Mr. President and Gentlemen: We have had to-day one of the most interesting and lively clinics that I have ever witnessed. There were over one hundred persons present. Although Dr. Evans; of Washington, and the gentleman who was to have exhibited the gas-motor, disappointed us, still the clinic was a very attractive one. Dr. C. B. Parker, of Brooklyn, presented a boy, about fifteen years of age, with a broken right superior central, the pulp of which was alive. The tooth had been broken crosswise, about in the middle of its crown, and the cutting edge replaced with a piece of porcelain, which was so beautifully adjusted, and its color so well matched with that of the tooth, that at the first glance I thought it was part of the natural tooth that had been broken and replaced and the fracture grown together again, as in a case that was presented at the clinic some years ago by Dr. William H. Atkinson. When viewed in a certain light the check or joint was really not perceptible; it was only when the boy stood somewhat sideways, that by an oblique light the difference between the porcelain and the natural tooth-substance could be detected. Dr. Parker brought a lady there for whom he performed a similar operation this afternoon. The tooth was a left upper central incisor, the mesial corner of which was replaced with a piece of porcelain. This, however, was a much different operation from that which I have just described. The enamel on the labial surface of this tooth was very thin and blue, and consequently the porcelain could not be matched in color so perfectly as in the other case; yet when it was adjusted and the operation completed it looked as well as it possibly could be made to under the circumstances; and I suppose it is serviceable, too. Dr. C. H. Land, of Detroit, Mich., especially deserves the thanks of this society for coming so far and giving us a very interesting clinic. He exhibited a new furnace, which is heated by gasoline, I believe, or naphtha. It is claimed that this furnace will not gas the continuous-gum work baked in it. He baked a lower piece which, to those who understand it, was absolutely satisfactory. Dr. Land also set one of his new crowns, which he calls over-coats. This is a new kind of crown, and is made in the following way: The doctor takes a thin piece of platinum (about No. 30) and fits it around a defective or malformed tooth. Then an ordinary plate tooth is ground out thin in such a manner that when held in position on the platinum cap it does not project, and is then baked upon the platinum with a body especially prepared for the purpose. This makes a very beautiful piece of work. The doctor also exhibited some models of bridge-work made in the same manner, and I have here some drawings illustrating this work.

[Drawings shown.] The bridge is secured around the teeth in the same manner as described by his new method, except that he brings down the lingual surface of the bridge quite close to the gum. Heretofore the practice has been to cut away the lingual surface of the bridge obliquely. The drawing represented one of the caps put over a tooth. Dr. Land showed a model at the clinic, which illustrated a practical case where the two upper lateral incisors had been badly developed. These two teeth, in which the pulps were alive, had been trimmed and normal-looking crowns adjusted. Dr. D. A. Caulkins presented a piece of bridge-work in his own mouth, which was placed there some time ago by Dr. Sheffield, I believe, but it was only to show how bridge-work can tumble to pieces. Three pieces of bridge-work had been inserted. The first was worn three months, when it became so offensive that it could not be worn any longer. Another was made, which very soon became loose, and then all the roots of the front teeth ulcerated and their extraction became necessary. There is now nothing remaining in the mouth but the two right superior molars and one left superior molar. Of course, the bridge in the present condition is useless. Dr. William T. La Roche exhibited a model of a case of irregularity of some interest. Dr. G. B. Lawrence exhibited a new electric motor, called the Diehl motor, which was on exhibition at the last clinic, only the dental attachment was not shown at that time. Dr. Lawrence also showed some cement composed of oxide of tin, oxide of zinc, aluminium, and liquid phosphoric acid. He claims that it is a more stable compound than the ordinary phosphoric acid compound heretofore in use, but that its preparation is much more difficult and requires a great deal of skill. Dr. Oliver exhibited a new Cogswell disk-carrier and guard. There was a gentleman there exhibiting some samples of an antiseptic, called ominico, which is composed of boracic acid, chloride of potassium, chloride of sodium, thymol, menthol, gaultheria, and carophyllus, samples of which were distributed. Dr. J. L. Williams exhibited a new form of tooth, which is very serviceable for bridge-work, single crowns, and ordinary plate-work. It is a plain tooth with a groove cut in each side, as well as on its base, which stands on the gum. Into this groove a staple is fitted; then around this staple and the posterior portion of the tooth a piece of thin platinum plate is fitted, put in position with the other teeth, and soldered. This groove and staple gives a very firm fastening, and if a tooth should break it can be easily replaced by a new one. There are no pins in these teeth, but the grooves will hold them in position, and the new tooth after fitting can be secured with oxyphosphate or any of the cements without putting the case in the fire. This is specially serviceable, I should say, for pivot teeth and

bridge-work, because it is not necessary to remove from the mouth either the bridge or the pivot tooth for the purpose of replacing a broken tooth. I presented a patient at the clinic this afternoon with a swelling on the lower left side of the jaw, which I at first took to be the result of an abscess. I removed the fillings from the mesial and distal surfaces respectively of the first and second molars, the cavities facing each other, and expected to find dead pulps, but the pulps of both were very lively. At that time Dr. Waldstein was in my house, and he examined the case. His opinion was that the swelling arose from some irregularity in the circulatory apparatus, and his diagnosis was that the lady had either heart or uterine trouble. The latter proved to be the case. But she was not satisfied; she thought there must be some trouble with her teeth, so I advised her to come to the clinic and have some other gentlemen see the teeth and the mouth. Dr. Atkinson saw it, and he agreed with Dr. Waldstein that the trouble was caused by an irregularity in the circulation; that the swelling was due to some varicosities of the vessels or blood tracts. There was very little pain in connection with the swelling. The lady had in her mouth a very large contour gold filling, which I showed incidentally, for the reason that the greater part of it had been inserted by the Herbst method. I also exhibited a little steel spring that came from Germany, which seems to be a steel tape-measure. It has given me a great deal of satisfaction in burnishing down approximate fillings, especially between the front teeth. The figures on the steel strip, which is very thin, make it a very beautiful instrument for rubbing down the gold over the edge of a cavity. When this strip of steel is drawn from one side to the other it does the work much better than a hand burnisher pushed between the teeth. I hope that The S. S. White Dental Manufacturing Company will try to secure this article for us.

At the last clinic there was presented a new form of gold, in the shape of sponge. Since that time I have experimented a little with the gold, and I deem it my duty to say a few words about it. Dr. Abbott came to my office one afternoon, and I took that opportunity to make some experiments while he was present, in order that he might see the results. In the first instance I pressed some of this gold into a matrix by hand-pressure, forcing it in as hard as I possibly could; in the second instance I filled the next hole of the matrix with the mallet, striking so hard that no human tooth would have withstood the malleting that I gave that gold. The results were these: In neither instance had I obtained a perfect adaptation to the rough wall of the matrix; which proves that, although the gold is very dense and hard wherever it comes in contact with the instrument, its adaptation to the walls of the cavity is bad. I have here

three plugs,—two the results of the described experiments with the new form of gold, and one made of Wolrab's German gold cylinders by the Herbst method. The Wolrab gold plug represents beautifully every irregularity in the walls of the cavity, but the other two are in that respect very defective. It is evident, therefore, that this gold may be used with great advantage for grinding surfaces, but the cavities should be first lined with a different form of gold.

Dr. W. H. Atkinson. The cases presented at the clinic this afternoon afforded observing men an excellent opportunity of seeing some magnificent work. I refer to the cases of restoration of fractured incisors by cementing porcelain faces to them, that were brought there by my friend Dr. Parker, and with which we were all so delighted. They certainly mark a step in advance. In the case of the little boy it was simply admirable, and I think the pulp in that tooth is alive and in good condition. In the lady's case I would regard it as better judgment on the part of the operator had a little more of the thin enamel been taken off to secure as good a joining in that case as in the other.

Incidents of Office Practice.

The secretary read a description of a case of osteo-sarcoma which Dr. Genese, of Baltimore, had sent the society, accompanied by a model of the case. It was that of a man, aged twenty-seven, who entered the hospital in Baltimore for treatment of a large swelling on the right side of his face. He had been struck in the face by the handle of a windlass thirteen years ago, when working in Wales. He had had no illness in his recollection; no venereal trouble; presented a healthy appearance; suffered no pain, and only desired the removal of the unsightly swelling. Professor Beidler sent for Dr. Genese in consultation, and it was diagnosed as a non-malignant osseous tumor, extending from the external plate of the superior maxilla, involving the malar and the zygomatic arch. It was not considered safe to give an anesthetic, anticipating severe hemorrhage and possible strangulation from the flow of blood. It was decided to remove the tumor from the inside of the mouth, to avoid an unsightly scar. Dr. Genese took the dental engine to the hospital on November 8, and assisted at the operation, which was performed painlessly with the use of "Nervine Vita," shown to the society on November 5, for obtunding sensitive dentine. It also arrested the hemorrhage, enabling the operation to be performed with comparative ease. The periosteum was dissected from the tumor, a five per cent. oleate of cocaïne being used, but without the effect of relieving pain, but immediately when the nervine was applied pain and hemorrhage ceased. The cheek being distended

and the periosteum being held away with the forceps, an incision was made along the upper border of the tumor with an inverted-cone bur. This was enlarged with a knife-edge bur, a chain-saw passed over, and a large section of bone removed. The entire growth was removed in three sections, the rough edges trimmed off with a knife-edge finishing-bur, and the periosteum covered over the freshly-cut surface, which was left covering the roots of the teeth, somewhat thinner than the normal alveolus (presenting a true healthy bone structure). After cleaning the mouth a dressing was applied of tannic acid, glycerin, and iodoform on lint. The swelling continued some days, but no bad after effects followed the operation. Two drachms of the nervine was used without injury to even the delicate periosteal membrane. The patient made a good recovery in twenty days, showing only an enlargement of the zygomatic arch.

Dr. W. H. Dwinelle. Mr. President and Gentlemen: I promised at the December meeting that I would show you some impressions of a case of erosion I referred to at that time. I bring them here to-night. They are of peculiar interest to me, as you may well imagine, from the success that attended the operation, and the encouragement that it gives to us all for treating similar cases. It seems as though teeth in this condition come to us in groups. "It never rains but it pours," as the old adage goes. I think since the case I then described I have had more of a similar character than in years before. It is a satisfaction, especially in view of the paper that was read here by Dr. Darby on the subject of erosion, that, while we were left at sea in reference to the cause and the cure of cases of this kind generally, in the instance I refer to here we could in our treatment approach something like an exact science. Here, at least, the cause was divined beyond all question. The remedy was equally well pronounced. In this instance, as I stated, the lady left my hands with her teeth in as perfect order as I could make them, and four months after returned to me with her teeth very badly eroded. As you will see by the impression taken before treatment, which will be handed to you, the marks upon them were sharply defined, and deep to such an extent as to nearly penetrate through the enamel into the dentine, and covering the entire labial surface of the teeth. I polished them down so that the enamel was exceedingly thin; and yet, as you see by this impression, taken nearly three years afterwards, there has been no repetition of the defect, and no reappearance of the erosion in the slightest degree. So it is clearly demonstrable that, having divined the cause of the trouble, which had been produced within a period of four months, we were enabled by the treatment I have described to arrest it so permanently that after about three years

there has been no return of it, and probably never will be. Dr. Westcott, a number of years ago, made a variety of experiments in regard to the erosion and decay of teeth. He subjected teeth to a solution of various substances,—acids, caustics, foods, and condiments,—and deduced a variety of exceedingly interesting results from these experiments. I remember that he found acids, especially those that were astringent in their nature,—such for instance as a solution from raisins, grapes, etc.,—peculiarly injurious to the teeth, and that some of them especially were more effective and more destructive than others. I have a lady under treatment now whom I had not seen for about eighteen months. She informed me that her teeth had been exceedingly sensitive since last June, in consequence of which she was unable to use a tooth-brush, and employed a cotton or linen cloth as a substitute. I found her teeth very badly eroded, and endeavored to learn the cause. It seems that she was in the habit of eating freely of what is known as grape-fruit each night on going to bed. She had a longing for this fruit, indulged in it constantly, and her mouth was thus kept saturated with an astringent acid, which accounted for the ravages upon her teeth. I treated these teeth after the manner I have described, and polished down the upper third of the labial and buccal surfaces of about eight of her anterior teeth, in some instances quite through the enamel. The cause having been ascertained, we employed the remedy, and I have no doubt that I have succeeded in arresting the destructive process as entirely and permanently in this case as in the one previously described. Her teeth were in perfect condition when I dismissed her.

Dr. C. E. Francis. Mr. President, these cases related by Dr. Dwinelle remind me of one or two that recently came under my observation. A lady called at my office the other day whom I had not seen for some six months. I found her incisors very badly eroded, scarcely any enamel remaining on their labial surfaces. They were not in that condition when I previously saw her. She said she did not know what had caused it. I asked her if she had been in the habit of using lemons. She said no, but that she had eaten grapes through the fall of the year in great quantities. I presume that was the cause of the erosion. This very day a young lady visited me who had been sick for many weeks with typhoid fever. I saw her to-day for the first time since. Her teeth were very beautiful about a year ago, but to-day they are very badly eroded; full of pits; they have much the appearance of sticks of candy that have been put in water for a little while until the surfaces are partly dissolved. I decided to treat them in the manner Dr. Dwinelle has spoken of. I am also reminded of a case that I treated probably

fifteen or more years ago. A youth was brought to me with his teeth, particularly the four incisors and the cuspids above and below, badly pitted, caused by early ill health and a malformation of the enamel. We did not have dental engines at that time, so I took some sharp instruments and chiseled down the surfaces and polished them with stones. They kept beautifully. A number of little pits had reached the dentine, and those I filled with gold. I would like to relate a bit of office experience, to see if any gentleman present has had a similar trouble. Some two and a half years ago a gentleman called upon me who said his gums were in a very wretched condition, and his teeth were so sore he could not bite upon them. On examination I found his gums were of a dark purple color, very much swollen, and ready to bleed at the slightest touch of the instrument. The teeth were completely incrusted with salivary calculus, and the labial surfaces of the incisors covered with green mucoid stains. I spent some time in cleansing his teeth. Several times I treated his gums, and got them in quite a respectable condition; his teeth were comfortable and he could masticate as usual. Everything seemed to go right. I gave him all manner of caution. I told him he must have his teeth and gums examined frequently, which he promised he would do. But promises are not always kept. He called on me probably a year and a half after, and his teeth were just as bad as or a little worse than before. He did not come until he was compelled to. To-day he put in an appearance again, and really, when he opened his mouth, to see the incrustation of tartar would suggest the use of a plough to remove the calculus. His inferior incisors were so very loose that I think I could remove them with my fingers. Have any of you had such instances, where you do the best you can, caution patients, give them the best advice regarding the care of their teeth, and in three or four months they will need the same care again? I have here a tooth which I would like to have gentlemen present see. A young lady came to me, probably some eighteen or more years ago, being then sixteen or seventeen years of age. On looking over her mouth I said to her, "If you do not take better care of your teeth they will all go to destruction. They are completely incrusted with tartar and badly stained, and you must brush them or lose them." She said her old dentist had told her that she would not keep her teeth over ten or fifteen years any way. She has been in the habit of calling on me for eighteen years past, perhaps once or twice a year. I have done the best I possibly could to keep her teeth clean, and I have spent a great deal of time in removing calculus and other extraneous matter, and treating her gums as well as I was able to. Apparently everything was going pretty well. Three or four months ago, however, she came back

with her teeth in just as bad condition as ever, covered with food, calculus, green stains, gums dark purple—a very sickening sight. The lady called at my office the other day having the toothache. She had given up all idea of having her teeth filled, because they were so sore, and she could not bear to have them touched. In my absence she had called on another dentist, who said to her, when he found she had been in my hands, that Dr. Francis had badly neglected her teeth, but that even now *he* could treat her teeth and save them. This particular tooth that I show you he said he could still save. And yet the calculus had deposited upon it down to the very apex of the root. She has been to Dr. Hasbrouck and had it extracted. She laughed at the idea of anybody trying to save her teeth. I wonder if anybody else here ever had any such cases.

Dr. Bödecker. I have the pleasure of announcing that Dr. Caulkins makes this society a present of the piece of bridge-work exhibited by him to-night. At the same time, I think the society owes a vote of thanks to Dr. Land for coming so far to instruct us, and as well to Dr. Williams for his very able services to this society and to the clinic. I move, therefore, that we pass a vote of thanks to those two gentlemen, and also to Dr. Caulkins for the present which that gentleman makes to this society.

Dr. Bödecker's motion was carried unanimously.

President Carr. We will now listen to the essayist of the evening, Professor Frank Abbott, whose subject is

The Treatment of Pulpless Teeth.

Dr. Abbott. Mr. President and Gentlemen: I hope you will kindly pardon the very short paper I have to present to you this evening. It has been almost impossible for me to get time even to prepare the one I have, short as it is. I do not know, however, but that it will be best to present it just as it is. It is simply a practical paper, and nothing but that,—no elaboration one way or the other, but a straightforward description of my way of treating cases of this kind that come to me.

There are probably no operations which the practitioner of dental surgery is called upon to perform attended with more anxiety and uncertainty on his part, and in the successful performance of which more knowledge of pathology and the action of remedies is requisite, than in the treatment of "dead" or pulpless teeth.

Every dentist has more or less individuality, or rather his own particular ideas as to the proper treatment of such as well as all other cases coming under his care; consequently this paper will deal

with my own methods of managing such teeth, rather than make any attempt to go over the field as cultivated by others.

I propose, therefore, to consider the subject under four distinct headings, in order to make myself clearly understood, and to do so as briefly as I am able, as follows:

1. The treatment of pulpless deciduous teeth.
2. The treatment of pulpless permanent teeth.
3. The treatment of teeth where the pulp is still living in one or more canals and dead in others.
4. The treatment of teeth with alveolar abscess.

The treatment of pulpless deciduous teeth is, as a rule, not altogether a satisfactory operation, from the fact that, by the time the teeth of children have decayed to the extent that the pulps have become exposed and died, more or less of the root or roots of such teeth has been removed by absorption. The death of the pulp, as is well known, puts a stop at once to this physiological process, and in consequence the rough, jagged ends of the partially absorbed roots remain as a constant irritant. Of this particular condition I shall have more to say further on.

The first step in the treatment of these, as in all other pulpless teeth, is to cleanse them as thoroughly as possible of all the dead and putrefying pulp substance. This may be done with broaches, a little cotton-wool, together with warm salt water, alcohol, a weak solution of Listerine and water, a weak solution of carbolic acid and water, or any fluid substance of a non-irritating nature and slightly antiseptic, most convenient to the operator. After this is done satisfactorily, if a deodorizer is required, a solution of permanganate of potash, three grains to an ounce of water, will be found of service in dispelling any unpleasant odor, and at the same time serve as somewhat of a disinfectant. Then a sufficiently strong disinfectant, to destroy germ-life, is forced into the canals either with a fine syringe or the spray instrument (the latter is preferable). A small hole, about the thirty-second of an inch in diameter, is drilled through the side of the tooth, just under the margin of the gum, into the pulp-chamber. This differs from rhizodontrypy, in that the pulp-chamber and canals are cleansed. A cap of metal (I usually use thin platinum) is then placed into the bottom of the cavity, and, to be sure that the hole in the side of the tooth communicates directly with the pulp-chamber and canals, a small instrument is carried through the hole and into the pulp-chamber, and kept there until the metal cap is securely fixed in such a position that this communication is not subsequently interfered with. Upon this metal cap the filling is then placed, and the instrument withdrawn from the side of the tooth.

It will be observed from the foregoing that I leave the pulp-canals and a portion, at least, of the pulp-chamber not filled, but open and in direct communication with the mouth. This is done for the reason that in any attempt to fill such canals a portion of the filling material is liable to be carried through the foraminal opening, which is very much larger than normal before absorption had commenced. Again, the rough, jagged ends of the partially absorbed roots, directly in contact with the embryonic tissue (the remains of absorbed roots of temporary teeth), keeps up such a constant irritation that more or less exudation of serum is constantly taking place. If the pulp-canals under these circumstances are stopped up, thereby cutting off its exit, an abscess will inevitably result, while, with them open and free exit through the side of the tooth for such exudation, it seldom if ever occurs. This treatment, of course, is open to criticism, inasmuch as it invites, so to speak, a discharge through the canals, pulp-chamber, and side of the tooth into the mouth; but the answer is, it saves a sore, painful abscess, and the discharge is kept at its minimum. The entire canal may occasionally be quite thoroughly cleansed by the use of a weak solution of Listerine, or carbolic acid, with a Farrar syringe.

Pulpless permanent teeth, as far as cleansing and the use of deodorizers, antiseptics, etc., are concerned, are treated in the same manner as deciduous teeth, with the one difference that many pulp-canals of these teeth are so contracted and tortuous that they cannot be as thoroughly cleansed; the removal of *all* the dead and putrefying pulp substances being more than ordinary mortals can accomplish.

It is of course unnecessary to designate to so intelligent a body ot practitioners as this what particular teeth, or roots of teeth, are beyond perfect exploration. Suffice it to say, that in many teeth, after the most careful and thorough cleansing possible, a great portion of dead pulp still remains; and successful treatment depends in a great measure upon the condition, whether septic or aseptic, of that portion remaining.

I know very well that my teaching does not accord with that of some gentlemen in this society, in that I do not use nor recommend the use of drills in pulp-canals for the more thorough (as they claim) cleansing of such canals, and the "breaking up of the nest of putrefactive organisms at the ends of roots." Years ago, when I had had less experience, I tried it, and learned a lesson which I have never forgotten and think I never will. I have here two valuable specimens showing this kind of work,—one of them from the hands of an expert at this manner of treatment; one a lateral incisor, the other a first molar, both upper, the conditions of which here presented I

think are a sufficient warning to all dentists to keep drills out of pulp-canals, particularly for the purposes above enumerated. Each of these teeth, or, I should say, the bungling work done upon them, produced a fearful and most uncompromising abscess, which was relieved in each case only by the removal of the tooth.

After the cleansing is as thoroughly done as the conditions altogether will admit of, an antiseptic, such as Listerine, a solution of bichloride of mercury (one to two thousand), or a solution of carbolic acid, is thrown into the canals with the spray instrument; then a pellet of cotton-wool saturated with the remedy is placed in the cavity, and it is then sealed up with gutta-percha and wax, to remain one or two days, when it is removed, and the spraying and general antiseptic treatment repeated. This is done three or four times, at intervals of from one to three days, when, if no pain or soreness of the periosteum (pericementum) is present, the filling is completed in the following manner:

First, a very small bit of cotton-wool is carried to the end of the pulp-canal, and there packed tightly. This is to prevent the forcing of the filling material proper through the foramen; the remainder of the canal is then filled with oxychloride of zinc, mixed to about the consistence of cream. To facilitate this part of the operation, a few fibres of cotton-wool are used as a vehicle for carrying the oxychloride more readily to the location desired. The crown cavity is then filled. This disposes of the operation, provided the tooth has but one root and one pulp-canal, and that easy of access. If, on the other hand, the tooth under treatment has two or more roots or canals, and one or more of the canals is unexplorable, the case is treated as follows: After having filled, as above described, all accessible canals, a pellet of cotton-wool of a size to pass loosely into the pulp-chamber, is saturated with the thin mixture of oxychloride and placed into it (the pulp-chamber); then a piece of gutta-percha, large enough to a little more than fill that portion of the cavity, is warmed and gently but firmly pressed into the cavity. By this means the oxychloride held in the cotton-wool is forced into the minutest opening. Should the slightest pain be produced by this proceeding, the pressure should be stopped at once, when in a few minutes the pain will subside. The gutta-percha and pellet of cotton are then removed, and the crown filling completed with any material desired.

In teeth of more than one root it not infrequently happens that the pulp is found still alive in one or more of them, while in others it is dead. In the treatment of such cases the first step taken is to endeavor to save the live portions. In order to do this an application of creasote is made—after the pulp-chamber has been well

opened and cleansed, and as much of the dead pulp removed from the other canals as can be conveniently—and the cavity sealed up with gutta-percha and wax. This may remain two or three days, when it is removed, and if the live pulp is intact carefully cap it with oxyphosphate. After this capping becomes sufficiently hard to admit of the further treatment and filling of the open canal, it is done in the manner previously described.

In case an abscess has developed and is discharging through the gum, the treatment is somewhat different, except as to cleansing, the use of deodorizers, antiseptics, etc. After cleansing has been satisfactorily accomplished and these remedies are forced into and through the abscess, a solution of chloride of zinc (forty grains to an ounce of water) is forced through the canals and abscess, until it is seen coming out of the fistula. The canals are then filled with the same material and in the same manner as before described, except that the bit of cotton-wool to stop the foramen is left out. The operation is at once finished. The objects of doing this at the one sitting are: first, a thorough and antiseptic cleansing has been accomplished; secondly, the escharotic effect of the chloride of zinc entirely destroys the pyogenic membrane which forms the sac or walls of the abscess proper, which with the pus produced by the excessive local inflammatory condition, discharges through the opening in the gum, and reparative granulation in a few days begins; thirdly, any subsequent work upon the tooth might result in pericementitis and a re-formation of the abscess.

In every case, after the operation upon these several classes of teeth (except children's) has been finished, the gum over the roots is "painted" thoroughly with the mixture, equal parts, of the saturated tincture of aconite root and tincture of iodine. Should any subsequent pericemental irritation occur, which manifests itself to the patient by slight soreness in biting, one or two applications of the aconite and iodine to the gum will invariably relieve it, unless the case has been allowed to go on until suppuration has taken place. Even then relief is sometimes obtained by its use. If, however, this fails, it may in very many instances be obtained by the application of the old-fashioned remedy, a hot raisin, prepared and used as follows: First, taking care to select a good fat one, open or split it in two, and remove the seeds; then dip it into water as hot as the patient can bear, and at once apply it to the gum over the tooth. This is repeated every half-hour for four or five hours, leaving one in position upon retiring at night. The relief following this treatment is in some instances almost beyond comprehension. A painful swelling, half the size of a robin's-egg, is often entirely dispelled in twenty-four hours.

President Carr. Gentlemen, the paper is open for discussion.

Discussion.

Dr. C. E. Francis. There is an immense amount of sound sense in that paper of Dr. Abbott's, and it has gratified me very much to listen to it. Speaking of the hot raisin process reminds me of an instance that occurred within a week. A lady, a new-comer, made her appearance with a swelled face the other day. An inferior molar had been very nicely filled. She said the roots were all filled; but her face was very much swollen, and the tooth was so sore that it could not be touched. I told her to keep her face bathed with cooling applications, and to put a hot fig against the tooth. In two days the swelling in the face had disappeared, a small abscess had formed near the tooth, and she was all right.

Dr. Abbott. In reference to the syringe,—if you want to keep a syringe from drying up when not in use every day, simply fill it with water and lay it aside with the water in it, which will remain for a long time without evaporating, and the syringe will always be ready for use.

Dr. F. Y. Clark. Mr. President, I think one particular point has been left out of Dr. Abbott's paper. I cannot imagine how a man so well prepared as he is to write upon this subject should neglect so important a point. As you all know, it is a very difficult matter to treat pulpless teeth with success. Where there is a fistulous opening we have no trouble; almost anybody can treat such teeth without fear of bad results. It is that class where there is no fistulous opening that we have to fear. I have for many years given this subject a good deal of thought; have written some on it, and investigated a good deal more, and I now assert that the main cause of the trouble in the treatment of those teeth is the forcing of débris in the root-canals into the foramen, thereby choking it up. Owing to that fact, when a patient comes with a tooth of that description, I never, under any circumstances, put my nerve instrument into any root of such a tooth. I remove the crown decay as much as possible, and clear out the pulp-chamber, and then use a very mild disinfectant. Perhaps it is better to use none. A little alcohol or ether is perhaps as much as it is safe to use. In twenty-four hours give it a washing out with warm water and a moderate application of creasote, but very little; perhaps one-tenth of a drop is as much as can be used with safety in that cavity. If you will try this treatment a few times I think you will have very little need of the hot raisin.

Dr. G. W. Weld. Mr. President and Gentlemen: The paper that we have had the pleasure of listening to this evening, although brief, is not only able and comprehensive, but it is, as the writer

stated, eminently a practical one. Perhaps of all the subjects which pertain to the dental art there is no one of so much practical importance as the proper treatment of pulpless teeth. That a large majority of such teeth when so treated are tolerated in the jaws and made to serve a useful purpose for many years is a fact which I think will be admitted, and is admitted by almost every dentist to-day. But there are cases, especially of women, with neuralgic tendencies, in which, when a pulpless tooth is filled, I care not how properly, trouble may be expected sooner or later. I have in my mind at the present time a lady who came to me about a year ago suffering from a second superior molar, and she gave me the following history: About a year previous she went to a dentist in this city, an able practitioner, and had two pulpless teeth treated; subsequently both of those teeth abscessed, and she was compelled to have them extracted. Knowing this history, I took special pains to prepare the three roots of that superior molar, cleaning out the pulp-chamber and canal as well as I knew how, and filling them. Yet in about a month after I ascertained that the tooth had abscessed, and that the lady had been to another practitioner and had it extracted. I have also another similar case, and yet it is dissimilar, which perhaps will lend interest to the subject of the evening. A gentleman came to me some five or six years ago suffering intensely with the left superior lateral incisor. On examining it I found there was an incipient abscess. He had lost the right lateral and wore a plate. He insisted, against my wish, on having this tooth extracted, saying he could wear two artificial teeth as well as one. On extracting it I took occasion to file off the root, and found this condition of affairs: That the tooth had been filled from the approximal surface, half way down the root, leaving at least one-half of the pulp in the canal. I will pass it around, because it is quite a curious case. That is a case of failure resulting from improper treatment. We may have success by proper treatment, and yet at the same time, notwithstanding this case, we may have failure from proper treatment.

Dr. W. H. Atkinson. Mr. President and Brethren: I intended not to speak to-night, but I think it is my duty to say something. In attempting to discharge my duty I will first ask a question. What have we learned to-night? Have we had anything but unsubstantiated, unphilosophical pronouncements? Have we had a single case of clear diagnosis brought before us that would naturally indicate the proper treatment of the cases that have been presented and that are called failures? Failures undoubtedly they are in the estimation of those who come to that conclusion; failures so far as retaining the teeth in their sockets by the treatment they received.

But have we the evidence that a proper manipulation might not have saved even any one of those teeth? What are the facts? That we do not know how to deal with all these cases, and we jump at conclusions, and follow the advice of the patient, and simply keep on the surface, as the last example indicated, where the lady was going from shop to shop,—and why? Because she felt she did not know all about her case, and she was not really sure, from what she saw of the frittering attempts that were made that they in whose hands she was knew any more than she did. We have had a repetition of the roasted-fig and the heated-raisin treatment presented to us to-night. Do men know what they are talking about? Do they understand inflammation and its processes and what is necessary to favor and what is necessary to check it? Some say that we have nothing to do with medical questions. We have dealt with nothing else to-night. We are dealing with disordered functions. Many of you have seen numbers of teeth in the mouth with their pulps dead and the teeth black, and they remained sound and useful during the life of the individual, until he carried them to the grave, without any disturbance. Many teeth are retained that have dead pulps in them by people who know nothing about it. We only know about those cases as they are presented. We ought to learn by our mistakes. I have seen hosts of just such cases as we have had here.

Where is the lesson to-night? I have given it to those who have been sharp enough to follow me, but I will take the fatherly privilege of calling your attention to it. Every pulpless tooth that you see in the mouth that is black and does not produce any irritation has been encysted at its end. Then there was no chance for any gas to be formed, *à la* Clark, to stir up trouble by its egress being arrested by the stuffing of something into the foramen. If that were really, as indicated, the source of the disintegration of tissue, that breaking up of the molecules and bringing into a gaseous condition the dust of which we are all made (every one of us in the last analysis is nothing but gas—there is sober truth in it), that tooth was not properly encysted. Then what would have been the proper mode of treatment by any one who understood the nature of the case and could diagnose it? He would have gone through the gate of ingress at the end of the root until he came to where there was living tissue, and obtained a union by first intention, or an encystment, that would have made that tooth useful for a long time. Let us not run before we are sent, and pretend to a knowledge that we have not. That is what ails us. Now let us be fraternal, and honest enough with ourselves to learn by our mistakes; and if you would do what I have asked you to so many times and so earnestly,

sometimes *ad nauseam*, "study the minute anatomy of the teeth," and the changes that take place in the tissues, whereby the blood is formed from the food and the tissues from the blood, and then how they are broken up, you would understand that if the débris is not carried away you would have a point where mischief might result in the organism, and then there would be an attempt on the part of nature to throw out the disturbing matter.

Why have we any of these cases? Because the organization is out of order; because the blood-making machinery is not properly exercised; and the great difficulty is that we do not breathe enough pure air to make us feel that we are men, and capable of discriminating between knowledge and the assumption of knowledge.

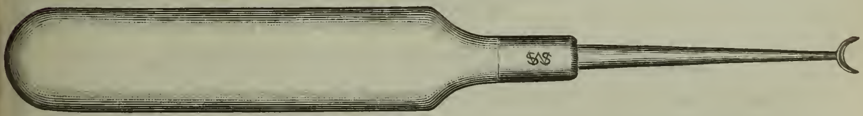
Dr. Abbott. I do not usually have such a flow of words as my friend Atkinson, and while I may not go through the fine paraphernalia of the circulatory apparatus, and how this and that material is converted into blood, and so on through the whole process of nutrition, yet if you will follow out my instructions I will guarantee that you will have as much success in the treatment of pulpless teeth as from anybody's treatment that has ever been advocated.

Adjourned.

B. C. Nash, D.D.S., *Secretary.*

PENNSYLVANIA ASSOCIATION OF DENTAL SURGEONS.

Dr. Chupein exhibited an instrument designed for the purpose of holding back the rubber dam while filling cavities on the labial surfaces of the incisors, cuspids, and bicuspids. He said that he believed he had purchased every clamp that had been offered in the market as an aid in filling cavities in these localities, but not one of them had ever been of any service to him. The instrument (see illustration) was merely a shaft about two inches long, terminat-



ing in a crescent-shaped end, and of a size sufficient to embrace the teeth named at these localities, and mounted in a suitable handle. It was held in place by the left hand of the operator, his arm being passed around and resting on the head of the patient, the dam being held back by the semi-lunar end and completely exposing the margins of the cavity, while with his right hand he manipulated the gold, which an assistant passed into the cavity. He said that he treated such cavities by first superficially preparing them and then

filling them with gutta-percha. This was crowded over against the gum margins, so as to force them from the borders of the cavity. At the next appointment the gutta-percha was removed, the cavity thoroughly prepared and filled with the aid of this instrument.

He spoke also favorably of the operation known as "knocking out the pulp," an account of which he had read in the "Hints and Queries" of the DENTAL COSMOS.

On the subject of amalgam, Dr. W. H. Trueman said that amalgam would contract or expand according as it was used. If used with too much mercury it would shrink as well as discolor, but if employed dry or in such a condition that it would work well, it would not shrink and would be less liable to discolor. A great deal of its behavior was due to the manner in which it was manipulated. He was sometimes afraid to use it very dry in very frail teeth, on account of its expansiveness when employed in that condition. He had used only one kind of amalgam for *twenty years*, and that was made according to Dr. Townsend's formula. The silver he used for this was the "trade dollar." It has been suggested that the preservative effect of amalgam *might* be due to the formation of corrosive sublimate, which was the king of all disinfectants and germicides, being efficacious in these respects when diluted even so much as 5,000 times. Another reason was probably found in the oxidation of the tin or mercury next the dentine, producing that glassy, hard condition so frequently found in cavities filled with amalgam.

Dr. Chupein exhibited the model of a lower jaw, where the integuments on one side were inserted so high up on the ridge that an artificial plate could not be made without being displaced at each motion of the jaw. His idea was to make a plate by dressing away from the plaster model the portions representing the interfering tissues, and when ready to insert the plate to sever the integuments. All of the members present concurred in this opinion.

THEODORE F. CHUPEIN, D.D.S., *Secretary.*

ODONTOGRAPHIC SOCIETY OF PHILADELPHIA.

THE twenty-third annual meeting of the Odontographic Society of Philadelphia was held at the College of Physicians, Thirteenth and Locust streets, May 18, 1886.

The following officers were re-elected: Jos. R. C. Ward, president; C. A. Kingsbury, first vice-president; Charles E. Pike, second vice-president; J. N. Wunderlich, treasurer; Charles E. Graves, recording secretary; Alonzo Boice, corresponding secretary; S. J. Dickey, curator; J. C. McCartney, librarian; Thos. C. Stellwagen, L. Ashley Faught, and Wm. A. Breen, executive committee.

CHARLES E. GRAVES, D.D.S., *Recording Secretary.*

UNIVERSITY OF PENNSYLVANIA—DENTAL ALUMNI.

The annual meeting of the Society of the Alumni of the Dental Department of the University of Pennsylvania was held in Medical Hall, May 1, 1886.

Officers were elected for the ensuing year as follows: J. W. Noble, D.D.S., president; C. C. Southwell, D.D.S., first vice-president; Colin S. Carter, D.D.S., second vice-president; J. A. Schmidt, D.D.S., third vice-president; J. P. Winner, D.D.S., secretary and treasurer; H. B. McFadden, D.D.S., corresponding secretary; Grafton Monroe, D.D.S., orator; Drs. L. F. Jack, G. L. Curtis, J. R. York, D.D.S., W. V. Bradley, D.D.S., and J. B. Hills, D.D.S., executive committee.

Drs. Howard, Peters, and Curtis were appointed as delegates to the American Dental Association; and Drs. Jack and Noble to represent the Society of the Alumni in the Pennsylvania State Dental Society.

A committee was appointed to take appropriate action respecting the deceased members of the society, Drs. C. R. McFarlan and W. S. Conto, and resolutions were adopted testifying to the loss the society had sustained in the death of these "ardent, sincere, and valuable members," to their excellence of character, and tendering the relatives and friends sympathy in their bereavement.

LEBANON VALLEY DENTAL ASSOCIATION.

The Lebanon Valley Dental Association held its eleventh annual meeting in the parlors of the Mansion House, Mauch Chunk, Pa., May 18 and 19, 1886.

Several interesting essays were read, and the following officers elected for the ensuing year: E. P. Kremer, president; Joel E. Slegel, vice-president; J. H. Mease, treasurer; W. H. Scholl, corresponding secretary; W. A. Cortright, recording secretary; E. P. Kremer, C. B. Wagner, and J. H. Mease, executive committee; H. J. Herbine and W. A. Cortright, delegates to the State Convention.

The next meeting will be held at Lebanon, Pa.

W. A. Cortright, *Secretary*, Mauch Chunk, Pa.

ILLINOIS STATE DENTAL SOCIETY.

The annual meeting of the Illinois State Dental Society was held at Rock Island, Ill., May 11 to 14, 1886.

The following officers were elected for the ensuing year: W. T. Magill, president; C. B. Rohland, vice-president; J. W. Wassall, sec-

retary; Louis Ottofy, assistant secretary; T. W. Pritchett, treasurer; W. B. Ames, librarian.

A novel and instructive feature of the meeting was furnished by Dr. G. V. Black, who conducted a series of tube cultures of the micro-organisms of the mouth, in an incubator which was set up in the hall where the meeting was held. The changes and progress of the growths were exhibited and described twice daily.

Jacksonville was chosen as the next place of meeting.

J. W. Wassall, *Secretary*,
208 Dearborn avenue, Chicago, Ill.

CHICAGO DENTAL CLUB.

A new dental society was organized in Chicago on May 18, 1886, under the name of the Chicago Dental Club.

The following officers were elected: L. P. Haskell, D.D.S, president; Charles P. Pruyn, M.D., D.D.S., vice-president; Arthur B. Freeman, M.D., D.D.S., secretary; Dr. E. M. S. Fernandez, treasurer; John S. Marshall, M.D., E. S. Talbot, M.D., D.D.S., and Dr. I. A. Freeman, business committee.

This society will be in affiliation with the American Dental Association, and one of its chief aims will be the development of the younger men in the Chicago profession.

Arthur B. Freeman, *Recording Secretary*,
325 West Madison street, Chicago.

GEORGIA STATE DENTAL SOCIETY.

The eighteenth annual meeting of the Georgia State Dental Society and Examining Board was held in Masonic Hall, Macon, Ga., May 11 to 14, 1886.

After a very interesting and profitable session, the following officers were elected for the ensuing year: C. T. Osborn, president; B. H. Patterson, first vice-president; W. G. Browne, second vice-president; W. L. Smith, recording secretary; L. D. Carpenter, corresponding secretary; H. A. Lowrance, treasurer.

Adjourned to the second Tuesday in May, 1887, the place of meeting to be decided.

L. D. Carpenter, *Corresponding Secretary*, Atlanta, Ga.

DENTAL SOCIETY OF THE STATE OF NEW YORK.

At the annual meeting of the Dental Society of the State of New York, held at Albany, N. Y., May 12 and 13, 1886, the following

officers were elected for the ensuing year: Norman W. Kingsley, president; B. Rathbun, vice-president; J. Edw. Line, secretary; W. H. Atkinson, correspondent; H. G. Mirick, treasurer. A. M. Holmes and A. P. Southwick were re-elected members of the Board of Censors. The degree of M.D.S. was conferred upon W. H. Frazer, J. S. Appleton, and J. H. Trall. W. W. Walker, S. B. Bridge, O. J. Gross, W. C. Stewart, and F. A. Green were made permanent members.

J. Edw. Line, *Secretary*, Rochester, N. Y.

IOWA STATE DENTAL SOCIETY.

The twenty-fourth annual meeting of the Iowa State Dental Society was held in Iowa City, May 4 to 7, 1886.

There was a very large attendance, and the whole session was full of interest. The membership now numbers 113. The following are the officers elected for the ensuing year: L. E. Rogers, president; W. H. Baird, vice-president; J. B. Monfort, secretary; J. S. Kulp, treasurer.

Cedar Rapids was chosen as the next place of meeting, the first Tuesday of May, 1887.

J. B. Monfort, *Secretary*, Fairfield, Iowa.

SIXTH DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The following is the list of officers elected at the seventeenth annual meeting of the Sixth District Dental Society of the State of New York:

G. W. Melotte, president; S. W. Adamy, vice-president; E. D. Downs, secretary; Frank B. Darby, treasurer; C. G. Sumner, censor. Delegates to State Society: G. W. Melotte, four years; Frank B. Darby, four years; and C. E. Dunton, one year.

E. D. Downs, *Secretary*, Owego, N. Y.

AMERICAN DENTAL ASSOCIATION.

The Committee of Arrangements of the American Dental Association had hoped to give full and definite information in the July number of journals in regard to all the details of the arrangements for the annual meeting of the association, to be held at Niagara, August 3, 1886.

As the railroad rates thus far secured, however, have not been as satisfactory as the committee yet hope to obtain and are working for, they will issue a circular later to all members of the association, and to local societies as far as possible. Those who are not members of the association and who wish the circular will please

drop a postal to the chairman of the committee to insure their getting it.

The railroad rates thus far secured on all leading lines are one and a third fare round trip, to be issued upon presentation of certificate. Definite information concerning this will be given in the circular, if better terms and arrangements are not made.

The hotel rates will be as follows: The International Hotel will receive dentists and their families at $3.00 per day; the Cataract, at $4.00 per day; the Niagara, Prospect Park, and Hotel Atlantique, $2.00 per day, if rooms are applied for and secured in advance.

The Park Theater, adjoining the International, has been obtained as the place of meeting.

Do not be anxious about not receiving the circular. You will get it some time in July, but a few days' delay in issuing the circular may mean a good deal of money saved to those attending the association. For instance, the arrangements were not completed and circular issued until the latter part of July, last year. A month earlier it would have been *impossible* to have gotten the low rates finally secured. Remember, we *promise* nothing better than we now publish, but will continue to work for more favorable terms.

J. N. Crouse, *Chairman Com. of Arrangements*,
No. 2231 Prairie avenue, Chicago.

PENNSYLVANIA STATE DENTAL SOCIETY.

The eighteenth annual meeting of the Pennsylvania State Dental Society will be held at Cresson Springs, commencing Tuesday, July 27, at 10 A. M.

Rates at the Mountain House, $3.00 per day to delegates and their families. The Pennsylvania Central, Northern Central, and Philadelphia and Erie Railroads will sell special excursion tickets, orders for which may be obtained from the corresponding secretary; otherwise regular excursion rates will be charged. Other roads will sell at the usual excursion rates. Programme and general information to be obtained from

W. H. Fundenberg, *Corresponding Secretary*,
958 Penn avenue, Pittsburg, Pa.

WISCONSIN STATE DENTAL SOCIETY.

The sixteenth annual meeting of the Wisconsin State Dental Society will convene in Milwaukee on Tuesday, July 20, 1886, the sessions to continue for three days.

The State Dental Examining Board will hear applications for admission to the society on Monday, July 19.

Claude A. Southwell, D.D.S., *Secretary*,
Milwaukee, Wis.

MINNESOTA STATE DENTAL ASSOCIATION AND BOARD OF DENTAL EXAMINERS.

The Minnesota State Dental Association will meet in the State Capitol at St. Paul, July 21, 22, and 23, 1886. A cordial invitation is extended to members of the profession.

M. G. Jenison, *Secretary*,
301 Nicollet avenue, Minneapolis, Minn.

The Minnesota State Board of Dental Examiners will meet in St. Paul, at the Ryan Hotel, at 9 A. M., Friday, July 24, 1886 (immediately after the close of the session of the Minnesota State Dental Society).

J. H. Martindale, *Secretary*,
No. 414 Nicollet avenue, Minneapolis, Minn.

NEW JERSEY STATE DENTAL SOCIETY.

The sixteenth annual convention of the New Jersey State Dental Society will be held at the Coleman House, Asbury Park, July 21, 22, and 23, 1886.

A cordial invitation is extended to all members of the profession to attend the meeting. Dr. Wm. Herbst, of Bremen, has kindly consented to give a number of very interesting clinics on his method of filling teeth by rotation. Hotel rates will be $2.50 to $3.00 per day. Two hours from New York and Philadelphia.

Chas. A. Meeker, D.D.S., *Secretary*,
No. 27 Fulton street, Newark, N. J.

EDITORIAL.

THE ANNUAL GATHERINGS.

The American Dental Association will meet at Niagara Falls, Tuesday, August 3.

The Southern Dental Association will meet at Nashville, Tenn., Tuesday, July 27.

The National Dental Association will hold its biennial meeting at Washington, D. C., commencing Tuesday, July 27.

The National Association of Dental Faculties will meet at Niagara Falls, Wednesday, August 4.

The National Association of Dental Examiners will meet at Niagara Falls, at 11 A. M., Monday, August 2.

STATUS OF AMERICAN DIPLOMAS IN GERMANY.

Our attention having been called, by a paragraph in a daily paper, to an order of the Consul-General at Berlin affecting the interests of the American dentists practicing in Germany, we requested the Department of State to furnish us with the full text of the order referred to, and received in reply the following:

Department of State, Washington, May 18, 1886.

To James W. White, M.D., Editor, etc.,
Chestnut street, corner Twelfth, Philadelphia, Pa.:

Sir: I have to acknowledge the receipt of your note of the 14th instant, and to enclose herein, pursuant to your request, a copy of a despatch from the Consul-General at Berlin, under date of the 14th instant, respecting dentists with American diplomas in Germany, with the instructions of the Prussian Minister of the Interior in respect of such dentists.

I am, sir, your obedient servant,
James D. Porter, *Assistant Secretary.*

[Copy.]

United States Consulate-General,
Berlin, April 15, 1886.

Hon. James D. Porter,
Assistant Secretary of State, Washington, D.C.:

Sir: The legal status of persons who came to Germany with diplomas and certificates of American schools of dentistry has been for some time subjected to conflicting decisions. The Prussian Minister of the Interior and Medicinal Affairs has lately issued an instruction, according to which dentists who have graduated in the United States are prohibited from practicing as "royally licensed" dentists. They can procure, however, a regular "trader's license," and practice under the same. They are prohibited entirely from establishing or opening dental dispensaries (clinical institutions) where practical dentistry is taught, but may receive patients for treatment. Licensed American dentists may be allowed to give instruction in technical dentistry, but are prohibited from lecturing and teaching dental surgery, generally, or to give their places the character of a medical school, unless previously authorized to do so by the Government.

I am, sir, your obedient servant,
F. Raine, *U. S. Consul-General.*

NEGRO PHYSICIANS AND DENTISTS.

The Mebarry Medical Department of the Central Tennessee College of Nashville has, since its organization in 1876, conferred the degree of M. D. upon sixty-two young colored men, nearly all of whom are now in successful practice, and have won the respect of their neighboring white practitioners.

A School of Dentistry is now to be opened in connection with the Medical Department. Prof. J. B. Bailey, D.D.S., will teach opera-

tive and mechanical dentistry, and Prof. W. H. Morgan, M.D., D.D.S., dean of the Dental Department of Vanderbilt University, will lecture and give dental clinics. Lectures are also to be given by several of the prominent dentists of Nashville.

The Central College of Tennessee is to be credited for this effort to provide for the needs of a large class of colored people, who, if opportunity be afforded them, will avail themselves of the services of duly qualified physicians or dentists of their own race. We wish the enterprise success.

EUROPEAN UNIVERSITIES.

An esteemed correspondent has kindly furnished us with the following list of the locations of the Universities of Europe, which we are sure will be of value to many of our readers for reference:

Austria: Czernowitz, Gratz, Innsbruck, Cracow, Lemberg, Prague, Vienna.

Belgium: Brussels, Ghent, Louvain, Liège.

Denmark: Copenhagen.

England: Cambridge, Durham, London, Oxford.

France: Angers, Lille, Lyons, Paris, Poitiers, Toulouse.

Germany: Berlin, Bonn, Breslau, Erlangen, Freiburg, Giessen, Göttingen, Greifswald, Halle, Heidelberg, Jena, Kiel, Königsberg, Leipsic, Marburg, Munich, Rostock, Strasburg, Tübingen, Würzburg.

Hungary: Agram, Budapest, Klausenburg.

Ireland: Dublin.

Italy: Bologna, Cagliari, Catania, Genoa, Macerata, Messina, Modena, Naples, Padua, Palermo, Pavia, Pisa, Rome, Sassari, Siena, Turin.

Netherlands: Groningen, Leyden, Utrecht.

Norway: Christiania.

Portugal: Coimbra.

Russia: Charkow, Dorpat, Helsingford, Kiew, Odessa, Petersburg, Warsaw, Wilna.

Scotland: Aberdeen, St. Andrews, Edinburg, Glasgow.

Spain: Barcelona, Granada, Madrid, Oviedo, Salamanca, Santiago, Saragossa, Sevilla, Valencia, Valladolid.

Sweden: Lund, Upsal.

Switzerland: Basel, Bern, Geneva, Zurich.

VIRGINIA'S DENTAL LAW.

The following is the text of an act to regulate the practice of dentistry in the State of Virginia, which was approved February 26, 1886:

1. Be it enacted by the General Assembly of Virginia: That, from and after the passage of this act, it shall be unlawful for any person, except regularly authorized physicians and surgeons, to engage in the practice of dentistry in the Commonwealth of Virginia, or to receive license from any commissioner of the revenue, unless such person has graduated and received a diploma from the faculty

of a reputable institution where this specialty is taught, and chartered under the authority of some one of the United States, or of a foreign government, acknowledged as such, or shall have obtained a certificate from a board of examiners duly appointed and authorized by the provisions of this act to issue such certificates; provided, that nothing herein contained shall prevent any person from extracting teeth for any one suffering from toothache.

2. That the board of examiners shall consist of six practitioners of dentistry, who are of acknowledged ability in the profession. Said board shall be appointed by the Governor, who shall select from twelve candidates named by the Virginia State Dental Association at their next annual meeting, of whom two shall serve one year, two for two years, and two for three years, and to reside in different sections of the State; and each year thereafter two shall be appointed in the same manner from four nominees, to serve for three years, or until their successors are elected. All vacancies for unexpired terms shall be filled by the Governor from names furnished him by the board.

3. That it shall be the duty of this board: First, to meet annually at the time and place of meeting of the Virginia State Dental Association, and at such other time and place as the said board shall agree upon, to conduct the examination of applicants. They shall also meet for the same purpose at the call of any four members of said board, at such time and place as may be designated. Thirty days' notice must be given of the meetings by advertising in at least two of the daily papers published in the Commonwealth of Virginia. Second, to grant a certificate of ability to practice dentistry, which certificate shall be signed by said board and stamped with a suitable seal, to all applicants who undergo a satisfactory examination, and who received at least four affirmative votes. Third, to keep a book in which shall be registered the names and qualifications of each, as far as practicable, of all persons who have been granted certificates of ability to practice dentistry under the provisions of this act.

4. That the book so kept shall be a book of record, and transcripts from it certified to by the officer who has it in keeping, with the seal of said board of examiners, shall be evidence in any court of this Commonwealth.

5. That four members of this board shall constitute a quorum for the transaction of business; and should a quorum not be present on any day appointed for their meeting, those present may adjourn from time to time until a quorum is present.

6. That any person who shall, in violation of this act, practice dentistry in the Commonwealth of Virginia, shall be liable to indictment in the circuit, county, or corporation courts; and on conviction shall be fined not less than fifty nor more than two hundred dollars; provided, that any person so convicted shall not be entitled to any fee for services rendered; and if a fee shall have been paid, the patient, or his or her heirs, may recover the same as debts of like amount are now recovered by law.

7. That all fines collected shall inure to the public school fund of the county or corporation in which the prosecution occurs.

8. That nothing in this act shall apply to persons who shall be engaged in the practice of dentistry in this Commonwealth at the time of or prior to the passage of this act.

9. To provide a fund to carry out the provisions of the third section of this act, it shall be the duty of said board of examiners to collect from those who shall appear before them for examination the sum of ten dollars each.

10. This act shall be in force from its passage.

BIBLIOGRAPHICAL.

Pamphlets Received.

A Lecture on the Code of Medical Ethics. By G. E. Frothingham, M.D., professor of ophthalmology, etc., University of Michigan. Delivered before the Students' Medical Social Science Association, December 15, 1885. Published by request. Tecumseh, Mich: Herald Printing House, 1886.

Philadelphia Social Science Association: "Wife-Beating as a Crime and its Relation to Taxation." Read at a meeting of the Association, April 15, 1886. By Hon. Robert Adams, Jr., A.M., bachelor of finance, Wharton School. Published by the Association, 720 Locust street, Philadelphia.

Philadelphia Social Science Association: "The Balance of Power Between Industrial and Intellectual Work." Read at a meeting of the Association, March 25, 1886. By Miss Mary M. Cohen. Published by the Association, 720 Locust street, Philadelphia.

Second Annual Report of the United States Civil Service Commission, January 16, 1884, to January 16, 1885. Second edition. Washington: Government Printing Office, January, 1885.

Transactions of the California State Odontological Society, 1884 and 1885. An octavo pamphlet of 237 pages. San Francisco: William S. Duncombe & Co.

Philadelphia Social Science Association: "The Power and Duty of the President of the United States in Regard to Trade Dollars." Read at a meeting of the Association, February 18, 1886, by Dr. James C. Hallock, of Brooklyn, N. Y.

Transactions of the Illinois State Dental Society. Twenty-first annual meeting, held at Peoria, Ill., May 12th to 15th, 1885. Philadelphia: The S. S. White Dental Manufacturing Company.

Third Annual Report of the Iowa State Board of Dental Examiners, for the year 1885. Printed by authority of the General Assembly. Des Moines: Geo. E. Roberts, State Printer, 1886.

OBITUARY.

MR. JOHN JAMIESON.

Died, in Glasgow, Scotland, April 30, 1886, Mr. John Jamieson, at the age of eighty years.

Mr. Jamieson was a member of the firm of W. & J. Jamieson, of London and Glasgow, who were the first to introduce American dental goods to the European market, beginning with the teeth

manufactured by S. W. Stockton. They were subsequently made sole agents for the United Kingdom by Jones, White & McCurdy. Mr. Jamieson was highly esteemed for his many good qualities. One who had known him long and well thus expresses his estimate of his character: "He was a model of integrity and large-heartedness."

PERISCOPE.

On the Types of Tooth-structure in Mammalia.—The trifid form of the lower molar of the genus Monachus and of Mesonyx is in reality repeated in the cusps of the molars of Ungulata generally. In Sus the second upper molar cusp[1] sends a long basal process forward and outward toward the canine cusp, and may be said to represent the anterior cuspule of the trifid figure of the plan of the cusp itself, while the posterior cuspule is aborted. The bicuspid cusp exhibits a small anterior cuspule which extends directly outward to reach the base of the canine cusp. Both the ridges formed by these cuspules are the first to become worn in mastication. This plan of arrangement is repeated in several extinct genera, among which may be mentioned Phenacodus and Hyracotherium.

In *Hyracotherium cuspidatum*[2] the cuspule is placed obliquely to the true molar cusp, precisely as in Gymnura, instead of being continuous with the cusp,—the differences between the cusp and the oblique prolongation of the first molar cusp forward and inward being one of degree only.

In *Pliolophus vintanus*[3] the arrangement of the cusps appears to be exactly that of Sus. The only features which are lacking are those of the heel of the tooth and the shapes of the cusps themselves.

It may be said that the presence of ridges, especially of the oblique ridges, entering into the triturating surfaces of the tooth, relate to the survival of the small basal cuspules of the trifid figure. As may be easily supposed, the direction of the ridges is subject to much variation. In man such direction is along a line which connects the first molar and the bicuspid cusps, and this arrangement appears again in Hippopotamus. In *Mastodon Americanus* and Achænodon the cusps are without cuspules, which are seen only in aberrant examples of the last molars. In the former genus they have been figured by Leidy.[4]

The ridges representing the cuspules are unnamed in any regular manner by authors. They are said by Owen[5] to exist in the human tooth only. Leidy calls them the "accessory eminences;" Cope[6] the "lesser tubercles," "crests," etc. They enter into the "interstitial"

[1] The nomenclature of the cusps proposed by me in 1874 (*Dental Cosmos*, XVI, p. 617) is here followed.

[2] Cope. Wheeler's Survey, IV, p. 267, pl. LXV, fig. 18.

[3] Ibid, pl. LXV, fig. 1.

[4] Extinct Mammalia of Dakota and Nebraska, p. 245, pl. XXVII., f. 13, 15.

[5] Odontography, p. 453.

[6] Journ. of Acad. of Nat. Sci., 1874.

type of tooth of Ryder.[1] They constitute in part the intermediate (median denticules) cusps of Gaudry.[2] The object of the cuspule is to support the cusp, to the base of which it is attached. Indeed, it presents the first attempt to modify the bunodont type of dentition toward the lophodont type. It is consistently maintained only when the strain of impact is of moderate amount. Should the strain become excessive the lateral border of the tooth is arched inward, as first pointed out by Ryder.[3] In the presence of these strong arches or flutings the main surfaces of attrition no longer need the basal cusp supports, and they disappear. This change is illustrated in Palcosyops and Limnohyus.

When a tooth becomes worn and an island of dentine appears at the summit of the cuspule, it is often seen to be obliquely placed to the main cusp. This is occasionally seen in Achænodon and Mastodon and constantly in Hippopotamus. A key is in this way afforded to interpret the islands of the complex tooth of Phacochærus. Care should be taken not to be misled in applying this method of interpretation to intricate types of tooth-structure, such as Polymastodon and its allies, for in these genera there exist true cusps only (cuspules being entirely absent), and the third row of islands (when such exists) being simply a linear row of well-defined characters placed along the border of the tooth.

A tooth that has been for a long time subjected to the action of a dilute acid is entirely deprived of its enamel, and permits the superficies of the dentine to be clearly seen. It is of interest to note that the cusps upon the dentine of a tooth thus prepared, while corresponding in a general way to those on the free enamel surface, are sufficiently distinct therefrom to afford material for comparisons, and to suggest relationships of a different character from those determined by the study of the entire tooth. Thus the dentine cusps of the premolars of Sus suggest the form of the corresponding teeth in Monachus and of Mesonyx. The cusps of the third molar of Sus are strikingly like the molars of the Insectivora and of the lower molars of the genus Bathyopsis. *In like manner the dentinal surface of an aberrant molar tooth of man presents the essential features of teeth so remote as to recall the type seen in Centetes, Gymnura,[4] Chrysochloris, as well as in the numerous ancestral types described by Cope from the North American Eocene.*[5]

A practical method of studying teeth with the object in view of determining lines of descent is thus presented. The enamel-organ of generalized types it would seem furnishes groups of characters which are probably secondary in value (since the several parts of the organ indicate wide ranges of variation and of

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[1] Proc. of Acad. of Natural Sciences, 1878, 45.
[2] Les Enchainements du Monde Animal, Paris, 1878, 70.
[3] Loc. cit.
[4] The arrangement seen in Sus is the same essentially as in Gymnura. The minute cuspule on the crown of the first upper molar is in precisely the same position as in Sus, and indeed answers to it in every respect in the description of Mr. Dobson except that it is not connected to the anterior inner cusp as named by that author. It is a little curious that the dental formula of Gymnura is the same as in Sus.
[5] Report U. S. Geo. Sur. of Territory, III, 1884.

great adaptivity) to[1] those yielded by the modulations of the surfaces of the dentine.—*Harrison Allen, M.D., in American Naturalist Extra, March*, 1886.

[1] The more simple forms of teeth, such as those of the molar series of the peccary, show scarcely any differences between the enamel and the dentine surfaces, and it may be reasonably expected that the greatest contrasts will be seen in the teeth which present on the enamel the largest number of cuspules and cingula which bear rows of mammilations. The position of all small cusps between the four principal cusps of the bunodont molar is either directly between the cusps or placed obliquely to them. When in the position first named they represent the highest degree of specialization attained by the molars of the carnivores, or they exhibit a tendency towards the development of the transverse ridge of the tapirodont type of tooth. When in the position last named the cuspule described above leads to the oblique crest seen in Palæotherium and its allies.

HINTS AND QUERIES.

I HAVE a lady patient, about fifty years of age, who has been without her upper teeth during the last twenty years. I have made several rubber and metal plates for her, but she cannot retain them in her mouth for over a minute at a time on account of nausea. I have tried horse-shoe shaped plates without success, as she cannot retain a plate that extends as far back as the bicuspid line. The mouth is hard and the mucous membrane in a healthy condition. Can any reader of the DENTAL COSMOS suggest some kind of treatment to overcome this nausea?—F. E., *Brooklyn, N. Y.*

WHAT can be done to cause an obstinate alveolar abscess to heal? I have tried about all the remedies usually used in such cases, but without any appreciable effect. The tooth is the first upper bicuspid, and the roots are filled with gutta-percha. The patient is a man aged thirty, with a good constitution, and healthy.—BROOKLYN.

TO THE EDITOR OF THE DENTAL COSMOS:

Will some one kindly inform one of your readers, and at the same time many others to whom the subject is of interest, exactly what rights and privileges the degree of D.D.S. confers? Also, where is the line drawn, from a legal stand-point, between practitioners of "dental surgery" and "medicine?" Are graduates of dentistry entitled to perform surgical operations of all kinds upon the mouth and associated parts, notwithstanding the fact that systemic treatment is in such operations usually required? Are dentists qualified legally to write such prescriptions, and must druggists fill them without question?

A reply to these queries, through the DENTAL COSMOS, and any other information relating thereto, will oblige and enlighten a—STUDENT.

AN IMPROVED METHOD OF COMBINATION GOLD AND RUBBER WORK.—I send herewith a combination denture, a gold plate with rubber attachment of teeth by a method I have long used and found to possess many advantages over other methods for attachment of rubber or celluloid to metal plates. The method consists in punching the plate with holes with a punch devised for the purpose and herewith illustrated (Fig. 1), forming a number of depressions or pits in the palatal surface, which might be termed small air-chambers, and they certainly assist materially as such, especially in lower dentures, where the holes are punched in a row on the outside and inside about one-fourth of an inch apart and one-eighth of an inch from the margin (Fig. 2). For upper dentures, where the undercut or re-

cession of the maxillary ridge is so abrupt as to make it impossible to swage a plate to a proper fit, the plate can be trimmed to suit, making the upper portion of rubber, the perforation forming a firm attachment. I also send a three-quarter plate to show the method. There is no danger of springing the plate if proper care is used, and if by accident it should be out of shape, it is an easy matter to set it right by burnishing it upon the die.

I have used this method exclusively for a number of years, and have never had any objection offered by patients on account of the perforations.

Fig. 1.

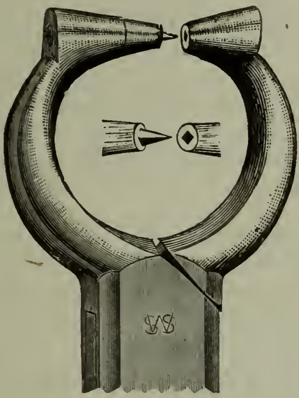
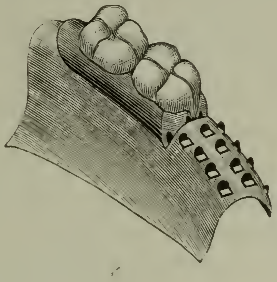


Fig. 2.



Dr. John H. Meyer, of this city, showed me some time ago a continuous-gum denture in which the entire surface of the plate was perforated with small holes, thereby reducing the weight of the metal about one-half, and making the most perfect attachment of the body, the perforations also assisting as small air-chambers.—A. S. Richmond, *New York*, *N. Y.*

A Case in Practice.—A lady, twenty-one years of age, applied to me to have the root of the right inferior first biscuspid extracted. Almost immediately after the extraction the second bicuspid commenced to ache. Counter-irritants applied to the gum failing to lessen the pain, I removed a filling from a carious cavity and from the canal, and passed an instrument through the apical foramen, which gave no relief. I then drilled for an external opening, causing a flow of pus, upon which the pain ceased. The next day the opening closed up, and the pain was very severe again for thirty-six hours, when another discharge of pus took place, with instant relief from the pain, but the mouth was so sore that she could scarcely open it. After about forty hours the opening closed again with renewal of the pain. I concluded to extract the tooth, but she fainted before I touched it. She revived when it was being extracted, but swooned again immediately, and continued to revive and faint for twenty minutes before she spoke, and then incoherently.

For eighteen hours she was delirious; then recognized her friends, and rested for six hours. When a paroxysm of pain in the jaw would occur she would faint, and on reviving would be delirious for several hours, with occasional syncope.

Every day the spells of delirium would be shorter, but sometimes so violent that she would have to be held down. When she was rational, if she attempted to sit up, she would faint, and then become delirious. She had attacks of delirium, but less violent, every twenty-four hours, till the sixth day, after which vertigo

and slight headache seemed to take the place of the delirium. She had slight pain in the jaw at intervals for a month after, but finally recovered.—VICTOR S. JONES, D.D.S., *Bethlehem, Pa.*

BABBITT METAL DIES.—In answer to inquiries as to why there is sometimes a depression in a casting of this metal, I may say that I have not had such an experience for many years until recently. The trouble seems to be in the metal, for I know that when Babbitt metal has been properly made, not only as to proportions, but, what is of equal importance, the proper putting together of its materials, such trouble does not occur, and I can say this after twenty-five years' experience in its use.

Oiled sand is always preferable for molding, because when once tempered it is always ready for use without delay and without bother from excess of moisture. The counter-die must not be made of pure lead, because its melting point is higher than that of Babbitt metal, but the alloy of one part tin to five parts lead may be safely used if the die is first coated with whiting. The die and counter-die should never be made of the same hardness, as in that case the plate is liable to be either torn or made thin in spots.—L. P. HASKELL.

DENTAL FORMULÆ.—The following prescription will be found by all dental practitioners a most useful one for the extraction of one or more worthless teeth at one sitting:

℞.—Stronger ether (Squibb's), ℥ iss;
Pip. menthol crystals (Todd's), ʒ i;
Fl. ex. cannabis indica, gtt xx;
Oleum menthæ piperitæ (Todd's), ♏ xv;
Misce.

Sig.—Saturate absorbent cotton with a small quantity (about sixty drops) of the compound, and apply to the gums, allowing it to remain about five minutes before operating.

Observe caution in applying *only* the proper quantity to the gums, and request patients not to swallow the saliva while the application is on the gums, as the maximum dose of cannabis indica is five drops.—EDWARD H. BOWNE, M.D., *Kingston, N. J.*

CONTINUOUS-GUM TEETH.—After mounting teeth in continuous-gum work, they are frequently found to be marred by black spots, which seem to be due to minute bubbles which come to the surface and break, leaving little depressions or cavities. This disfigurement may be obviated if, when the piece is taken out of the muffle and before handling, the whole surface of the teeth and gums are well rubbed over with common yellow soap; thus preventing the black dirt resulting from trimming and polishing from entering these microscopic air-bubbles.—K. C. E.

TO THE EDITOR OF THE DENTAL COSMOS:

Numerous inquiries have been made of me as to the best treatment of soft rubber goods when they have commenced to bloom, or, in common meaning, the sulphur works to the surface, making the rubber rough to the touch and less elastic than when newly cured. This defect can be easily obviated by the following treatment: Make a solution of common soda, one ounce to the pint of water; boil the article for two minutes in the solution, and it will regain its former softness and elasticity. Wash in clean water after.—GENESE.

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

DEVELOPMENT OF THE TEETH.

BY MYRON D. JEWELL, D.D.S., RICHFIELD SPRINGS, N. Y.

(Published by request of the Faculty of the Philadelphia Dental College.)

In the following study of histology the object is to note as briefly as possible the beginning of the formation of tooth-structure, and to follow nature through her various processes within the domain of the subject.

Our plan does not require a résumé of cell-development, nor an examination of the accepted theory of embryonal growth up to the period at which we shall begin our inquiry. Accepting the embryo as we find it, when nature is making what seems to be her first effort in the direction of tooth-development, we shall follow her, step by step, in regular gradation, as near as may be, assuming that in serial study only can we arrive at any logical deductions from the facts in the case.

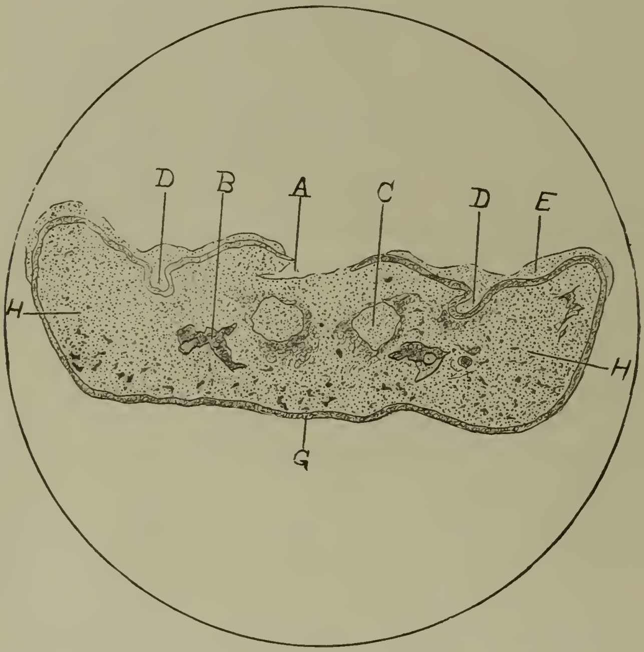
Fig. 1 shows a transverse section of the lower jaw of a 2½-centimeter pig, under low power, magnified about fifty diameters.

A glance at the drawing shows us a peculiarly-formed body, closely resembling in its general outline an Indian canoe. Near its center are two rounded bodies showing the position of Meckel's cartilages. Still further from the center, and near the cartilages, are seen tracings of the formation of bone, taking a solid color in the staining of the specimen. From the size of the jaw an idea can be formed of the extremely early period of fetal development at which this first step in the direction of tooth-formation is observable.

Without special mention of other tissues here exhibited, that which most interests us in this specimen is the deeply-stained line that describes the lower border of the specimen, and traverses its upper border just beneath the surface. Closely following the direction of this line along the upper border, at a point a little more than

half-way from the center on either side, there is discernible a dipping down of the line in the form of a loop or festoon, each one of which is inclined in the direction of the median line. Let us place the slide under a higher power, and study the structure of the parts immediately adjacent to this loop or band. The various tissues now assume more decided characteristic forms. In Fig. 2 the deeply-stained line forming the band is seen to be made up of cells closely resembling in form those immediately beneath them, differ-

FIG. 1.



LOW POWER. X 50.

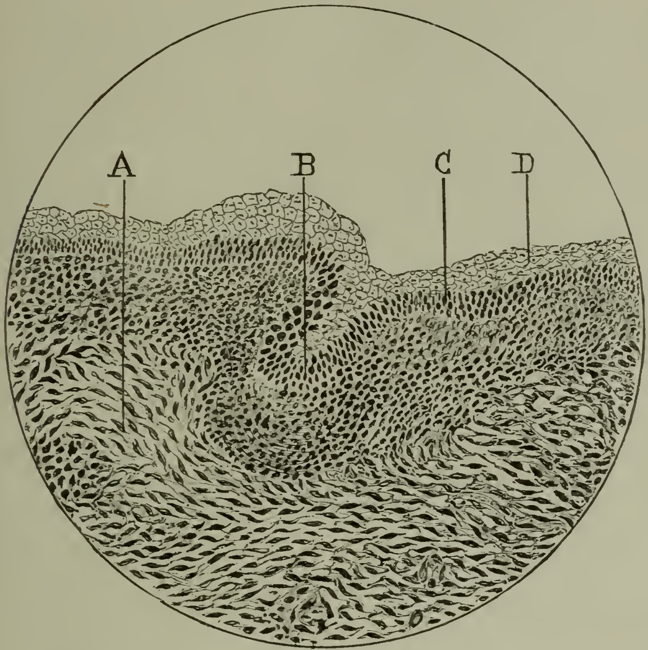
Transverse section of the lower jaw of a two-and-a-half centimeter fetal pig. A, Space caused by tearing out of tongue in mounting; B, Bone; C, Meckel's cartilage; D D, Dento-Malpighian fold; E, Epithelial cells filling and extending over the fold, and lining the cavity of the mouth; G, Malpighian layer, surrounding the entire specimen; H H, Connective-tissue.

ing chiefly in the fact that they are arranged with a considerable degree of regularity,—at least sufficiently so to be easily distinguishable, and separated from the cells lying below them by an occasional line of demarkation, which would seem to indicate a distinct formation, by showing a tendency to separate at that line in the shrinkage and tearing that accompanies the imbedding, cutting, staining, and mounting of the specimens. Furthermore, the cells making up the tissue of the parts immediately beneath this line, though lying in very close contact with and often flattened against

it, are never observed crossing over; and though the cells of the deeply-stained line may be nourished from the tissues beneath them, it nevertheless seems to be a distinct and independent formation, performing a special office in a manner peculiar to itself.

To obviate the liability to confusion in referring to this darker-stained line,—as we shall frequently have occasion to do,—though it and the more mature cells above it are properly considered to be the Malpighian layer,—we shall henceforward distinguish between the two by applying the term "epithelial cells," or "epithelium," to

Fig. 2.



High Power.

Section of Drawing No. 1 under higher power; magnified about two hundred diameters. A, Sub-dermal connective-tissue; B, Lowest point of Dento-Malpighian fold; C, Malpighian layer; D, Epithelial cells or maturing cells from Malpighian layer.

all that appears above it. Therefore, when referring to the Malpighian layer, we mean the darker-stained line only.

In Fig. 2 the Malpighian layer is seen to be made up of rounded and ovoid cells, taking a deeper stain, and arranging themselves with an evident attempt at regularity; at some points only one or two cells deep; at other points increasing to four and five, one above another, in such manner as to appear, at first sight, to be a row of vertical columns similar to young ameloblasts, the original rotundity of the cells being visibly affected by the compact order of their arrangement, each seemingly striving with the other to gain an

advantage that shall sooner take it into the greater freedom enjoyed by the epithelium above them.

From this layer, as has been intimated, seems to be formed the epithelial layer of the mucous membrane of the mouth; for, upon close examination, the cells composing the Malpighian layer are seen to be in a position that indicates an effort on their part to escape from their crowded condition into the freedom of the outer world, reminding one of the snapping of an apple-seed from between the fingers. Immediately upon gaining such freedom they seem to become the nuclei of the epithelial cells, increasing the size or diameter of their walls in all directions according to the pressure or juxtaposition of other cells, and seeming to possess all the essential qualities of fully-developed epithelial cells, while yet confined within the Malpighian layer. No sooner do they emerge from among their sister cells than their walls expand until they occupy several times their former space, and almost seem to move as we gaze upon them, as they must move when in a condition of life and development.

Just as we see these cells in the specimen, so were they arranging themselves in the process of the growth of the fetus, at the instant vitality ceased, in the specimen under consideration.

Recognizing that the primitive fold—the looped appearance of the Malpighian layer we are now studying—is formed by a dipping down of that layer, the question as to how this formation is brought about does not seem so very difficult to determine.

If we examine the general character of the sub-dermal tissues, it will be seen that they are of a uniform density, except at certain points,—particularly in the vicinity of the loops referred to, as shown in Fig. 1, where we see these cells closely crowded together, as though forced into that condition by pressure from above, and the advance into their domain of the Malpighian layer.

The force that has thus been exerted upon the Malpighian layer, to cause it to make this advance into the tissues below it, seems to be attributable to two principal causes: First, the compact form of those cells inclosed within this loop seems to indicate a more rapid proliferation and consequent pressure at that point. But as such pressure would naturally be exerted in the direction of the least resistance, and force the loose epithelium upward,—which it seems to do to a considerable degree,—is it not reasonable to suppose that, as a secondary cause, the general development of the parts by a rolling in, as it were, tending to duplicate the membrane upon itself, assists very materially in the formation of the fold, by permitting the Malpighian layer to be forced into the substance of the jaw? Viewed from above, this fold in the membrane would not be distinguishable, as it is entirely filled and covered over by the epithelial

cells that are eventually to form the mucous membrane of the oral cavity. This fold cannot, therefore, be called a groove. Instead of a groove, there is a decided heaping up of cells over the beginning of the fold, as has been shown.

This, then, is the primitive dental or dento-Malpighian fold, which in the human fetus is formed at about the thirty-fifth day of intra-uterine life.

At about the fortieth or forty-fifth day of fetal life in the human embryo occurs the first step in the formation of the deciduous teeth distinctively,—a phenomenon not usually considered in the study of tooth-development.

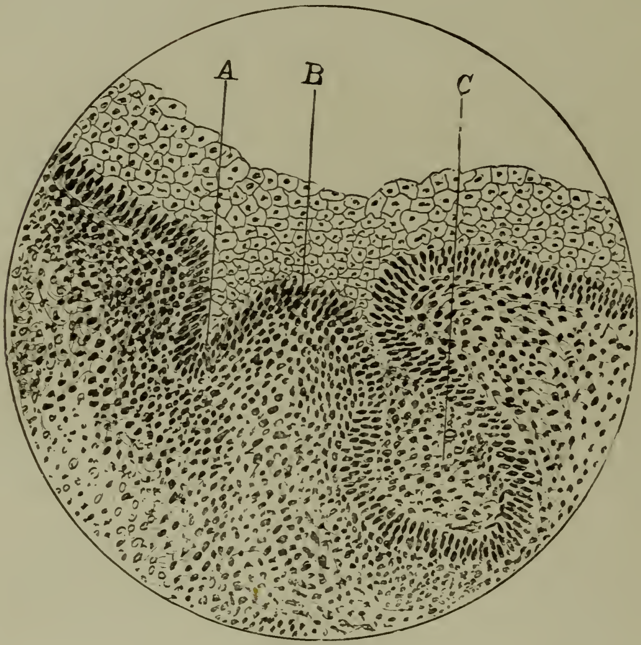
As the dento-Malpighian fold shown in Figs. 1 and 2 continues its progress into the substance of the jaw, it is met by such resistance on the part of the sub-dermal tissues as to cause an arrest of its progress in such manner as to produce a flattening of its deepest extremity. The cells lying beneath this flattened portion of the fold, as though taking advantage of this evidence of weakness on the part of the invader, advance, concentrating their power upon this point so effectually as to carry everything before them, until what was once the lowest extremity of the fold is brought back again very near to the position it occupied before the formation of the fold, the original loop being doubled back within itself, forming in reality two folds where there was but one. A longitudinal transverse section of the jaw at this period demonstrates this position.

This process having been completed, a transverse section shows a conical elevation of the substance of the jaw, with the Malpighian layer forming a loop on each side. These loops—or, more properly speaking, *folds*—are of prime importance, as we shall see. The outer fold is known as the band proper, while the inner one is designated as the lamina. It is from the latter that the embryo-organs or matrices of the deciduous teeth arise.

Within the walls of the inner fold the peculiar character of the cells, the multiplication or expansion of which we considered as taking part in the formation of the original dento-Malpighian fold, here again, and much more markedly, appear to manifest their aggressive nature, by rapidly expanding and carrying before them the wall of the fold in the direction of the median line of the jaw, causing a protrusion of the wall, which soon assumes a bulbous or pear-shaped form, with its broad base forward; the neck being formed by the contraction of its walls behind the body. This phenomenon is seen to occur at points along the inner fold corresponding to the position of the forthcoming deciduous teeth; while that portion of the inner fold between the pear-shaped bodies is seen to

recede or disappear, so that in a longitudinal transverse section of the jaw the newly-formed matrices appear like rounded buds putting forth from the side of a delicately-curved stalk. These bud-like bodies continue to expand and to dip downward into the body of the jaw, preserving their connection with the parent stalk by a tube-like elongation of their necks.

FIG. 3.



HIGH POWER.

Vertical transverse section of lower jaw of four-centimeter fetal pig, showing bulbous expansion of inner fold, magnified about two hundred diameters. A, Position and remains of original fold; B, Ridge-like elevation of sub-dermal cells carrying before it that portion of the wall of the fold at B in Drawing No. 2; C, Bulbous expansion of inner fold, forming matrix.

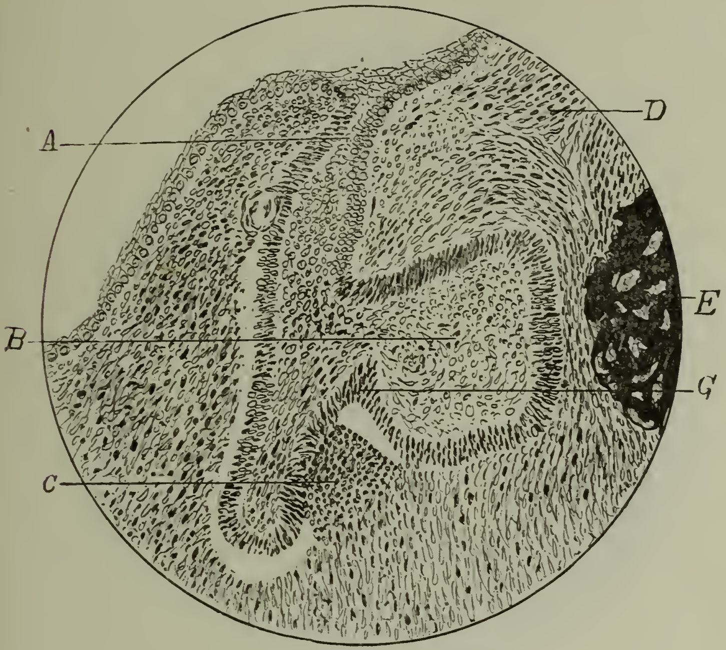
The formation of one of these bodies, where expansion of its walls has well begun, is shown in Fig. 3, taken from a vertical transverse section of the lower jaw of a 4-centimeter pig, magnified about 200 diameters. At A is seen the outer lip of the fold. At B is shown the point of the ridge-like elevation of sub-dermal tissues, with what was the deepest portion of the original fold lying above and covering it. At C the budding from the inner fold is seen as a simple expansion of that portion of the fold by the enlargement of the epithelial cells contained within its walls.

Having thus briefly considered the formation of this body, the

development and office of which is to be our principal study, the next step will be a consideration of the appearance of the papilla, or pulp-germ, which eventually becomes the pulp or ganglion of the tooth, and its influence upon the matrix or enamel-organ.

The tendency of the matrix, the formation of which we have just considered, is to grow downward (or upward) into the body of the

Fig. 4.



High Power.

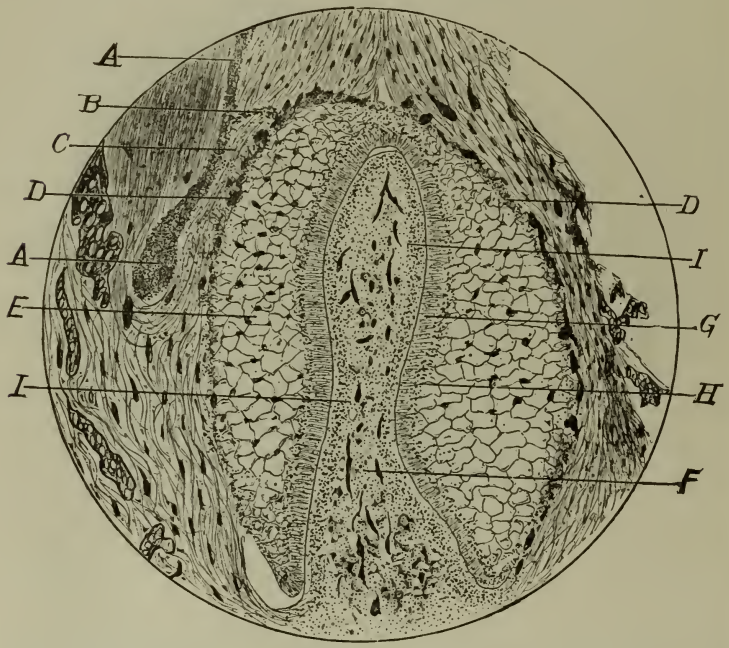
Vertical transverse section of jaw of a two-and-a-half months human fetus, in the region of the lower molar, left side; magnified about two hundred diameters. A, Neck of matrix; B, Contents of matrix enlarged; C, Papilla forcing up lower wall of matrix; D, Portion of the ridge separating the two lips of the fold; E, Bone; G, Lower wall of the matrix being carried up by papilla.

jaw, expanding as it proceeds, until it meets an obstruction in the form of a dense mass of small, round cells, constituting the papilla in its primitive form, which is to all appearances developed from the embryonal tissue surrounding it. The tendency of the papilla is to grow towards the surface in a direction exactly opposite to the course of the matrix. Therefore, when these bodies meet, as shown in Fig. 4, by what is evidently a prearranged plan of nature, there is a direct antagonism of forces. Neither will turn aside for the other; consequently, the papilla being of a conical form, and the matrix a yielding mass like a light rubber ball, the papilla, as de-

velopment progresses, is almost entirely enveloped by the matrix, which forms a double cap or hood over the papilla.

This peculiar condition is well illustrated by pressing the end of the thumb against the side of a soft rubber ball until it is met by the opposite side. Held in this position, the thumb represents the papilla, while the compressed rubber ball with the double hood thus formed is an almost exact representation of the invaginated matrix.

FIG. 5.



LOW POWER.

Vertical section of pre-molar in ten-centimeter pig, injected. A A, Cord of permanent; B, Neck of matrix; C, Tissue of ridge originally forming the two lips of the fold; D D, Outer tunic, rich in blood-vessels; E, Stellate reticulum; F, Pulp, showing its blood supply; G, Ameloblasts, forming; H, Inner tunic; I I, Deep stain showing beginning of odontoblasts.

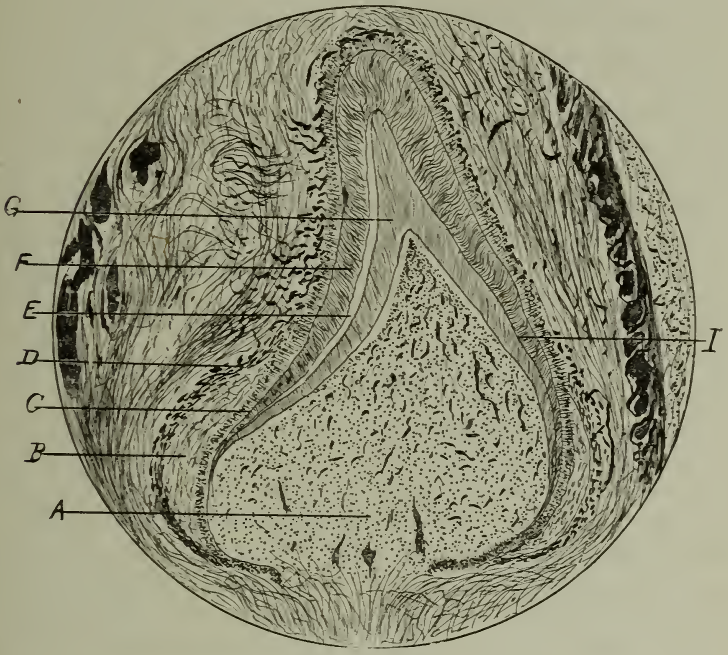
This process is known as the "invagination" of the matrix, and is shown very accurately in Fig. 5, which represents the period when the process has gone so far that the invagination is nearly complete.

Considerable interest centers in Fig. 5. Not only does it give the invagination of the matrix showing an outer and inner tunic, with stellate reticulum between, but it also shows us the means furnished by nature for a supply of blood to the parts. Both in the papilla and outer tunic of the matrix minute blood-vessels are shown, taking a deep blue tint in process of injecting.

The necessity of the blood supply to the outer tunic will be considered under the head of the deposit of the lime-salts of the enamel.

Another point of interest is the cord of the permanent tooth, which is seen as a continuation of the original cord for the temporary tooth. The septum or ridge of separation being no longer required, has given way and allowed the cord of the permanent tooth and the matrix of the deciduous to settle down into the body of the

FIG. 6.



LOW POWER. X 50.

Transverse vertical section of superior central incisor of eighth-month human fetus, injected, showing the closing in of the outer tunic with its blood-vessels stained blue. A, Pulp; B, Stellate reticulum; C, Inner tunic; D, Outer tunic at point of union with inner tunic; E, Space between dentine and enamel, caused by shrinkage; F, Enamel; G, Dentine; I, Point from which Fig. 7 is made.

jaw. The part connecting the cord of the permanent tooth and the sac of the deciduous is seen to be in an atrophied condition, significant of a probable early and complete obliteration. Attention is also called to the increased thickness of that wall of the matrix forming the inner tunic. Under high power we should see ameloblasts in process of forming, although not sufficiently mature to deposit lime-salts.

We have thus far followed nature in the development of tooth-germs, and have seen that they arise from two entirely different

sources,—the papilla from dermal tissue, and the sack that forms the matrix from epithelial tissue. We have seen them approach each other, and have followed them through the phenomenon of invagination, and now find them in position to begin the formation of dentine and enamel.

Fig. 6 is from a vertical transverse section of a superior central incisor of an eighth-month human fetus, injected. This is by far more complicated than either of the specimens we have studied. Heretofore the changes we have noted have been in form only. But we have presented here tissues entirely new, and differing greatly from anything that has come under our observation, while some of the forms with which we have become familiar are so changed as to have in great measure lost their characteristic features. This change is most marked in the altered form of the matrix. That portion that we have known as the outer tunic seems at first sight to have disappeared, but upon closer examination is seen to have settled down or closed in upon the inner tunic, and to have become so closely adherent that no line of separation can be discerned; the two membranes having to all intents and purposes become as one tissue, excepting that well up upon each side, the closing in of the outer tunic has not been completed and the stellate reticulum still separates the two membranes. This view is still further confirmed by the rich plexus of blood-vessels shown in the figure, which are identical with the blood-vessels that we saw developing along the exterior surface of the outer tunic in Fig. 5, and that are here so prominently shown in a more advanced stage of development. That these blood-vessels belong to the outer tunic is clearly shown, as they are seen distributed along its exterior border *above the separation of the two walls by the stellate reticulum*, and appear in the latter *nowhere*. It is reasonable to suppose, therefore, that the inner tunic is not supplied with pabulum directly from the circulation of the follicular wall until the enamel-organ as such has disappeared and the outer tunic has closed in upon the inner.

The formations of enamel and dentine so faithfully shown in the specimen are entirely new tissues. Consequently new and increased demands on the constructive forces are being made. Lime-salts are to be deposited, and from whence are they to be obtained except through the agency of the circulation? Surely not from the stellate reticulum in sufficient quantity, for the stellate reticulum is developed from the embryonal epithelial cells, which we have followed from their origin in the primitive dento-Malpighian fold, as shown in Figs. 3 and 4, and their office, it would seem, is but to distend the walls of the matrix and so prepare it for its invagination. It cannot be in any sense a secreting organ.

It will readily be seen that the cells contained within the walls of the matrix have not increased in number to any appreciable extent since we saw the pear-shaped body putting forth from the side of the fold. (Fig. 3.)

They have simply expanded until their walls have become a network of formed material, with their nuclei clinging in its meshes. Hence the name,—stellate reticulum,—starlike network.

Having thus accounted for the disappearance of the outer tunic, as such, a study of the inner tunic or wall of the matrix is now in order. Knowing its connection with the outer wall, we will begin at the point of union of the two walls and trace it. Beginning at the point of the sickle-like form assumed by the two walls as they together curve in above the papilla, we discover the same orderly layer of cells that we studied in the beginning as the Malpighian layer, save that the attenuation of the wall has relieved lateral pressure, and the cells have become more universally rounded. As we follow we soon find these cells sending forth a peculiar striated, granular substance towards the pulp. This appearance of an elongation of cells increases until they assume the form of ameloblasts, as we saw them in Fig. 5.

We are still able to distinguish the rounded cells of the Malpighian layer, three or four cells deep, preserving its integrity and throwing out the ameloblasts towards and all over the apical surface of the pulp.

Where enamel is being deposited the ameloblasts at once assume a more decided character, and the opportune approach of the outer tunic with its ample supply of blood-vessels affords a reinforcement that enables them to carry on their work of forming enamel.

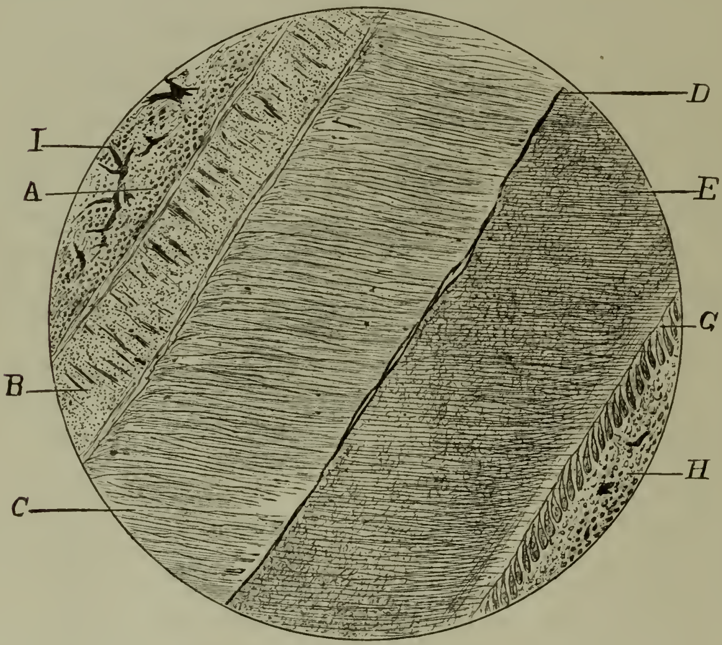
Odontoblasts are developed from the connective-tissue cells of the pulp. They are specially endowed for the purpose of forming dentine. After performing their office they persist as the membrana eboris upon the surface of the pulp.

After the odontoblasts are formed, the work of building both enamel and dentine seems to begin at the line of separation between the odontoblasts and ameloblasts,—first at the cutting-edge or apex of the papilla, and gradually working down or up the sides as the case may be; the bone-forming membranes gradually retreating in opposite directions as their work is accomplished. The matrix and ameloblasts control the formation of the crown of the tooth externally, while the form of the pulp-cavity and nerve-canal of the root is regulated by the pulp and odontoblasts, as they recede in advance of the accumulating dentine.

That a clearer idea of the relative position and general appearance of the various tissues under consideration may be had, attention is

called to Fig. 7, made from a point marked I in Fig. 6, magnified about 200 diameters. On the right is shown pulp-tissue (H) and odontoblasts (G); on the left the united tunics with blood-vessels (A) and ameloblasts (B), enamel (C) and dentine (E) occupying about equally the intermediate space. A slight stretching of the specimen in mounting has separated the enamel from the ameloblasts suffi-

Fig. 7.



High Power.

Section of Fig. 6 at I, showing relative position of tissues, magnified about two hundred diameters. A, Outer tunic; B, Ameloblasts; C, Enamel; D, Line dividing dentine and enamel; E, Dentine; G, Odontoblasts; H, Pulp tissue; I, Injected blood-vessels.

ciently to show a honeycomb appearance along the edge of the enamel next to the ameloblasts.

In another specimen in the possession of the writer, where a greater separation occurs between the tissues, the hexagonal form of the enamel-prisms is most beautifully and perfectly shown, and at the same time, though the ameloblasts have a decidedly striated appearance, yet they seem to be made up of a finely granular substance floating in the direction of the forming enamel, rather than a regularly arranged phalanx of columnar cells.

Odontoblasts, as we have had opportunity to study them, are possessed of a form peculiarly their own. They are comparatively

large, oviform bodies, terminating in an attenuated extremity, which in several instances have been seen to extend entirely across a considerable space caused by shrinkage between odontoblasts and dentine. To all appearances they are continued into the dentine. In the specimen under examination the odontoblasts, as shown in Fig. 7, look very much like apple-seeds, with a delicate sprout attached to their tips.

FIG. 8.

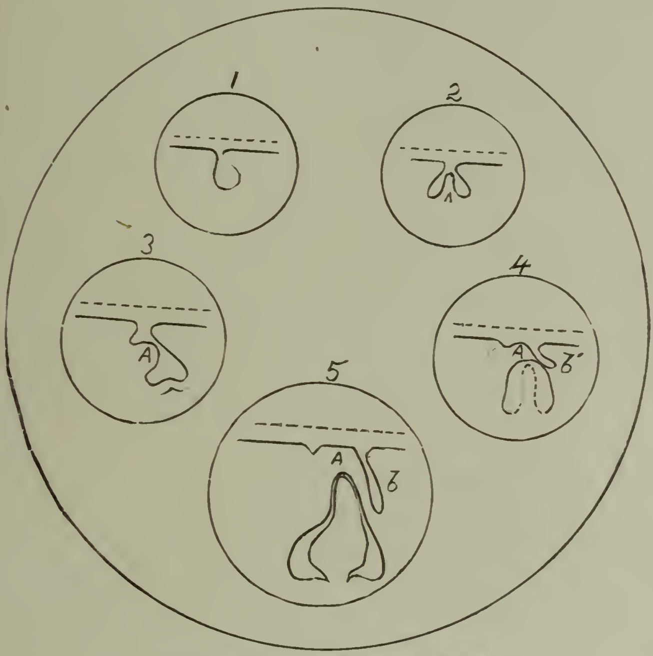


DIAGRAM OF THEORY OF TOOTH-FORMATION

Dotted lines in horizontal position indicate the surface line of mucous membrane. In circle No. 1, the solid line denotes the form of the dento-Malpighian fold. In circle No. 2 the solid line shows the formation of the outer and inner lip, by rising of the ridge A from the sub-dermal structure. In circle No. 3 the solid line shows the enlargement of the inner lip, the beginning of invagination, and the first appearance of papilla. In circle No. 4 the solid line gives the form of invagination complete, with the inner tunic represented by dotted line; cord of permanent elongated (b'). Circle No. 5 shows the closing in of the outer upon the inner tunic, and the relative position of the invaginated matrix and the elongated cord (b) of the permanent tooth.

In recapitulation, attention is called to a diagram somewhat after the plan of Goodsir, showing the several important steps in the development of the teeth as presented in the foregoing paper. In Fig. 8 we have endeavored to illustrate diagrammatically the five principal steps in tooth-formation, up to the period of the formation of enamel and dentine, presenting the different phases in the order in which we think it has been made evident that they occur in na-

ture. In each of the small circles the horizontal dotted line represents the surface of the mucous membrane. The solid lines represent the various changes or convolutions of the Malpighian layer, which, as we have seen, is the epithelial origin of the teeth.

In the study of these diagrams, each figure represents the position of a tooth of the left side, the formation of the deciduous tooth being always towards the median line from the fold. Therefore, in these diagrams, to prevent confusion, they are all shown as forming towards the right.

In circle No. 1 the primitive fold—the dento-Malpighian fold, as we have known it—is shown. It must be further borne in mind that there at no time exists an empty groove, as shown diagrammatically in the figures. The division of the primitive fold into an outer and inner lip, by a rising up of a ridge of tissue from below, is shown in circle No. 2. The expansion of that portion of the inner lip of the fold; corresponding to the position of the deciduous tooth in the formation of its matrix or enamel-organ, together with the first appearance of the papilla and the beginning of the process of invagination, is shown in circle No. 3. In circle No. 4 we have represented the complete invagination of the matrix, the outer walls of which are marked in a solid line, while a dotted line indicates the inner tunic. At this period we found ameloblasts first making their appearance. In circle No. 5 the closing in of the outer tunic upon the inner is illustrated. The process is shown as not yet completed, that a better idea may be conveyed as to what is meant. This process of the closing in of the outer tunic seems to be coincident with the beginning of the formation of enamel and dentine, the two tunics coming together first at the apex of the papilla, when it is seen that the first deposit of enamel and dentine are found; the supply of blood brought by the approaching outer tunic furnishing the lime-salts for the enamel, while the lime-salts of the dentine are supplied by the blood-vessels developed in the papilla.

In circles Nos. 2, 3, and 4 the letter A denotes the position of the ridge-like formation that rises from the body of the jaw and forms the inner and outer lip from the primitive fold. This formation seems to preserve its integrity until the separation of the deciduous tooth-matrix from its origin. There being no further occasion for its maintenance, its line of demarkation being obliterated, it becomes merged into the surrounding tissues and its outline lost. The cord of the permanent tooth is either derived from the side of the temporary enamel-organ, or is a continuation of its cord, or it is developed directly from the mucous membrane of the mouth.

In further study, it will be seen that the papilla—that which eventually becomes the pulp of the tooth—does not appear until

the body that forms the enamel-organ has penetrated the substance of the jaw to a considerable depth. This body, however, preserves its connection with the cord of the permanent tooth until ameloblasts begin to form. The ameloblasts are developed from the under or pulp side of the inner tunic.

Enamel is seen to be formed at the extremities of the ameloblasts next the pulp, and as the work of building the enamel proceeds, from this line outward, the ameloblasts recede before it, keeping up the supply of calcific material until the work is finished.

The odontoblasts, situated at the periphery of the pulp, and supplied with pabulum from the circulation in the pulp, begin the deposit of dentine at the line of the enamel, building from without inward, and continuing until the tooth is fully formed. They, too, recede towards the pulp-chamber and canal as their work is accomplished.

Cementum is laid down upon the periphery of the dentine of the root in a manner differing but very little from the formation of cortical bone,—in fact, cementum is only modified bone.

Where eminent authorities disagree, it will not be strange if a novice should have fallen into error, but continued investigation will establish the truth, for which we are all seeking.

ON THE LINING OF CAVITIES.

BY A. B. HARROWER, D.D.S., PHILADELPHIA, PA.

Consideration of the subject of cavity lining widens its extent to such a degree that it is with much hesitation this article is offered for perusal. But, as little appears to have been written on the matter, and the writer deems it of much importance, he offers this meagre contribution in the hope that it may promote a more exhaustive discussion, give us more and better materials, secure for the practice the consideration which it merits, and lead to its fuller adoption.

In the use of the four filling materials—gold, amalgam, gutta-percha, and zinc-phosphate—we are confronted with effects which go far to counterbalance the good arising from closure of the cavity of decay and restoration of contour. These effects arise from either the physical or physiological properties of the substances in question, and consist of discoloration of tooth-structure, pulp irritation, and the loss of fillings—either through their resting upon an unstable foundation, the recurrence of decay, or the fracture of frail walls.

Discoloration may arise from infiltration of the oral fluids after the insertion of a filling of gold or amalgam which is leaky through inefficient manipulation, or of gutta-percha, which is leaky no matter

how well introduced; it may arise, in the case of amalgam, from the production of metallic salts which stain the dentine; or, it may depend upon the character of the dentine itself, exudation from which causes, in some cases, serious change of color; and, lastly, it may be consequent upon recurring decay.

Pulp irritation frequently arises from thermal shocks, transmitted by metallic fillings, and this irritation may ultimately cause congestion and death of the pulp. Oxychloride of zinc is also capable of causing severe irritation, and both fillings and linings of that material often have to be removed on this account. The injudicious use of filling materials containing phosphoric acid has already furnished considerable evidence of the ability of that material to cause pulp trouble, and more is likely to be forthcoming.

Referring to the loss of fillings through insecure foundations, those cases only are in view where a firm base cannot be obtained by excavation without producing undesirable results—notably, the too close approximation of filling and pulp, where the material to be introduced possesses no adherent properties, or where it cannot be inserted without a dangerous amount of pressure.

When loss of fillings by recurring decay is mentioned it is intended to apply only to those cases in which the location of the cavity compels the use of materials not in harmony with tooth-structure,—namely, gold and amalgam.

The loss from breakage of frail walls often results from the want of adhesion possessed by the filling, there being little or no actual support afforded by the material to the thin layer of enamel.

In all these cases the evils referred to may be largely obviated by judicious "lining," the materials available being varnish and the various zinc plastics,—namely, the oxychloride, oxysulphate, oxyphosphate, and nitro-phosphate of zinc, and in one set of cases gutta-percha in its various forms. Linings of varnish are hardly a novelty, having been used under gold fillings fully forty years ago; but the practice never seems to have spread, probably through the habit of using too thick varnish, the consequent slowness in drying and thick, clumsy film rendering the process unsatisfactory in the extreme. The writer can testify to his own abandonment of the practice under the above conditions, and only the employment of varnish of a proper consistence enabled him to resume and continue its use.

The materials which are or have been used for lining-varnishes comprise sandarac, copal, shellac, inspissated Canada balsam, mastic, etc.; these being dissolved in ether, chloroform, absolute or methylic alcohol. Of these solvents absolute alcohol has proved itself the most satisfactory; ether, though a rapid dryer, producing, through that very rapidity, a greater degree of cold than the alco-

hols, and, in addition, possessing an odor exceedingly obnoxious to many persons. Methylic alcohol is, also, open to the latter objection, while chloroform dries almost as rapidly as ether, and its use is not quite unattended with risk.

Of the different gums and gum-resins previously enumerated, sandarac has best stood the test of time and use. It is easily soluble in alcohol, hardens with sufficient rapidity, makes a reasonably strong varnish, and leaves on drying an opaque, whitish film, which aids to a certain extent the attainment as well as the maintenance of a desirable color.

The following is the formula usually employed:

Selected sandarac-tears, ...	3 grs.
Alcohol, ...	1 dr.

Recent experiments with gum damar have led to its introduction as an ingredient of lining-varnishes, attention having been called to its suitability by the resistance it offered to the action of water and the toughness of the film. The proper consistence is obtained by dissolving in hot alcohol as much of the gum as it will take up. The solution is allowed to cool and settle and the clear portion carefully decanted. This varnish leaves, on drying, a strong film, possessed of decided tenacity and resistance to water. In these respects it is superior to the sandarac varnish, but this superiority is partly counterbalanced by its want of opacity,—the latter quality being a very desirable one in lining those cavities in front teeth wherein the walls are transparent and other linings contraindicated. By mixing the two varnishes, however, we obtain a new one which possesses, in great measure, the good qualities of both,—namely, the tenacious strength and resistance to liquids of the damar and much of the opacity of the sandarac. The proportions may be varied to meet the indications, but a varnish composed of equal parts of each seems most generally useful.

No. 1.	Sandarac varnish, } Damar varnish, }	equal parts.
No. 2.	Sandarac varnish	2 parts.
	Damar varnish	1 part.

This latter gives greater opacity and is reasonably strong.

As will be seen from the preceding formulas, the effect of varnish-lining is—to leave upon the cavity-walls a thin, semi-opaque, whitish film, which is non-conducting, non-irritating, insoluble, impervious to moisture, and more nearly in harmony with dentine than any metallic substance.

The action of such a film in preventing discoloration consists,

firstly, in the interposition of a material whose opacity tends to obscure the color of the filling when viewed through thin walls, and whose own color approaches that of the dentine; secondly, in its—to a certain extent—hermetically sealing the dentinal tubuli, thereby preventing exudation; thirdly, in protecting the dentine from permeation by metallic salts or the products of leakage; and, lastly, by retarding decay, through its harmony with tooth-substance.

"On general principles, all cavities which can be kept perfectly dry should be varnish-lined," with the exception of those cases in which we desire certain therapeutic effects from the filling material. Especially does this apply to the incisors, cuspids, and bicuspids, whether filled with gold, amalgam, or gutta-percha; the occasional discoloration under gold; the more than occasional discoloration under amalgam, and that disagreeable change in tooth colors known as clouding, which so frequently follows the insertion of a gutta-percha filling;—all being markedly controlled by a single or double lining of varnish.

The operation of varnish-lining is very simple: The cavity being properly excavated and guarded against the ingress of moisture, is carefully dried by the usual method.* A very small pellet of cotton is then taken, by a pair of delicate pliers, dipped in the varnish and conveyed to the cavity, where it is used as a brush to coat the walls. Five or ten minutes, according to the filling to be introduced—five for a plastic, ten for a gold filling—are allowed for hardening, and the cavity is filled as usual. The film can be rendered harder in the same period of time by a *gentle* current of warm air, and when, from any cause, it is difficult to allow even five minutes for the necessary drying, time may be gained by using the hot-air syringe. When a double lining is desired a second coat of varnish is added five minutes after the introduction of the first. This second coat is indicated under amalgam in bicuspids, etc., and is always advisable where the risk of discoloration is great, or an additional barrier to conductivity is desired.

In cavities with thin, or thin and frail, walls, through which the color of the filling would be plainly discernible, or which demand support, linings of oxychloride, oxyphosphate, or nitro-phosphate of zinc are indicated.

Without entering into any history of the nature and properties of the zinc plastics, there are a few points which deserve atten-

* It may be remarked that thorough drying of the cavity-walls by means of warm air permits the varnish to more decidedly adhere to the surface, and that a second layer of varnish increases the security afforded by the film.

tion, affecting, as they do, the use of the materials in question as liners.

Oxychloride of zinc is a comparatively slow setter, and possesses neither the strength nor the adhesiveness of the phosphates. It is a notable shrinker when used *in bulk*, and this property, joined to its want of adhesion, renders it inferior to either of the phosphates as a *strengthener* of frail walls. It exercises, however, in many cases what might almost be termed a tonic influence upon dentine—being decidedly provocative of recalcification; permits of no decay in contiguous tooth-structure; is easy of manipulation, and, altogether, is an eminently satisfactory liner.

Oxyphosphate of zinc is also a deliberate setter, does not shrink, is *decidedly* adhesive, is stronger than oxychloride, and constitutes an excellent liner in those cases where thin, frail walls demand a material which shall afford direct support through its adhesion as well as through its inherent strength.

Nitro-phosphate of zinc is a decidedly quick setter (a good fluid being granted), is moderately adhesive, does not shrink or expand, and possesses in a marked degree the attribute of strength. It is, therefore, peculiarly adapted for the support of frail walls, especially where they overhang, but is much more difficult of manipulation than either of the preceding plastics. These two latter materials have in common a certain attribute which renders them more desirable as "liners" than oxychloride. This is the smooth and tenacious plasticity which permits of their being placed in position with burnishers instead of cotton pellets, and of their being worked to a feather edge, of decided strength, at the margin of the cavity.

There is one quality which seems from experience to be justly attributable to both the phosphates, and to which the oxychloride cannot lay claim; namely, the ability to silently and stealthily devitalize the dental pulp. This dangerous property should always be borne in mind, and when they are used in deep cavities the pulp should be carefully protected. Even in *shallow* cavities a lining of varnish should precede the introduction of *any* material containing phosphoric acid. It is true that we hear and read of many instances of *pulp*-capping with oxyphosphate wherein the pulps have given no evidence of trouble, but the writer cannot help feeling that in a large proportion, *at least*, of these cases the silence is that of the tomb—a silence only to be broken by periodontitis, with some or all of its comcomitants.

It is sometimes taught that, in the use of oxychloride of zinc, the cavity should be filled with the material, allowed a day or two for hardening, and then burred out as desired—leaving only a lining. This practice is not in harmony with the attributes of the material,

oxychloride being a decided shrinker, and in some cases producing considerable pain, when used in bulk. Both these disadvantages are largely obviated by placing a thin film of the material in proper position, thus reducing shrinkage to the minimum and diminishing the ability to cause pain.

In using oxychloride a color should be selected slightly lighter than the adjacent teeth, the absorption of moisture usually rendering the lining a little darker than when introduced. This having been done, and the "mix" made of the proper consistence, a small portion is taken upon the point* of the spatula and placed in position against the wall of the cavity. It is then "pelleted"† accurately into place and allowed to harden for from five minutes to several hours, according to the kind of filling which is to be inserted.

When used for the purpose of affording a solid base to gold or amalgam, in cases where it is desirable to leave a mass of *soft* dentine at the bottom of the cavity, or where the pressure incident to the introduction of a gold filling is likely to injure the pulp, this organ should be protected against the action of the chloride of zinc by the interposition of *a thin shaving* of gutta-percha, adhesive plaster, double lining of varnish, or a stratum of oxysulphate of zinc.‡ This being done, the oxychloride is mixed somewhat thicker § than when used as a lining only, and the deeper portion of the cavity is filled up to the desired level. If an amalgam filling is to be introduced, the base should then be varnished and permitted to harden for ten or fifteen minutes; but if a gold filling is called for the remainder of the cavity should be filled with temporary stopping and allowed to set for a day or two.

The oxyphosphate and nitro-phosphate are so nearly alike in their properties, *as liners*, that they may be classed together as such. They are both possessed of decided strength, adhesiveness, and plasticity; the nitro-phosphate being superior in the former and the oxyphosphate in the two latter respects. A greater degree of quickness in setting renders the nitro-phosphate much more difficult of manipulation, especially with those unaccustomed to its use; while the slowness of the oxyphosphate in this respect permits of much

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* The spatula should be pointed, not round, at the end.

† "Plastics and Plastic Filling," p. 193.

‡ See "Plastics and Plastic Filling," p. 160.

§ With a good oxychloride the mixing should be a deliberate, not a hurried, operation, and it is astonishing how much powder can be incorporated with the fluid without destroying the working qualities of the cement, while materially increasing its hardness and diminishing its liability to cause pain.

deliberation in working. However, they are both applicable in the same range of cases, especially those wherein there are overhanging edges or exceedingly frail walls. In these, their adhesive quality, non-shrinkage, and decided strength* render them peculiarly valuable as supports, and indeed indicate their employment; while the tenacious plasticity which permits of their being worked to a thin yet strong edge at the margin of the cavity makes them specially acceptable as liners. Where it is desired to fill within a short time after lining, the nitro-phosphate is to be preferred, as it will set hard enough in ten or fifteen minutes to permit the insertion of a gold filling.

In using either of the phosphates as *liners* the mix is to be made somewhat thinner than when used as a filling.† It is placed in position by the spatula, and worked into apposition with the cavity-walls by means of smooth-faced instruments previously touched to an oil-pad. The edges are then trimmed and the material allowed to attain the requisite degree of hardness, after which the filling is introduced.

The writer cannot leave the subject of the phosphates without a reiterated caution as to the necessity of protecting the pulp against the effect of the phosphoric acid; the means naturally suggesting themselves to any practitioner. And he would, in addition, state that all remarks as to the relative value of the various materials as *liners* have not the slightest reference to their worth for fillings.

In protecting the pulp from thermal changes, we have such a variety of materials that a full list or description of the modes of using would pass beyond the limits of the present article. From court-plaster down to oxysulphate of zinc and temporary stopping, they have all done good work, and the writer would only remark that the efficacy of varnish in this connection has been far too much overlooked.

To recapitulate: Linings of varnish are indicated in all small cavities in the incisors, cuspids, and bicuspids where either gold, gutta-percha, or amalgam is to be used; under the phosphates where the cavity is superficial; and, in fact, in all cavities which can be kept dry, *except* where we wish to obtain the therapeutic effect of the filling material. Linings of oxychloride are indicated in cases of thin or discolored walls; where there is decided tendency to decay; or where the dentine is soft and we desire a therapeutic effect

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* All statements in relation to the phosphates are intended to apply only to those cases where a *good* fluid is used.

† For full directions as to working zinc-phosphate, see "Plastics and Plastic Filling," pp. 167, 209.

from the lining. In these cases there is nothing to equal oxychloride of zinc. The phosphates are indicated as linings where very thin frail walls or overhanging edges demand a material which does not shrink as much as oxychloride and which is more adhesive.

A SYSTEM OF CROWN AND BRIDGE-WORK.

BY ———.

In all of the various systems of crown and bridge-work which have been brought to the attention of the dental profession, one very important point seems to have been overlooked, viz., the comparative conformation of the necks of teeth of different classes. The general forms of the crowns of teeth have long been well known, but so far as we are informed no systematic classification of the shapes of the necks has heretofore been made. It would appear that such a classification ought to form the basis of any system of crown and bridge-work claiming a scientific foundation. To lay the ground-work of the system here described a large number of human teeth of the various classes were secured, their crowns cut off, and the shapes of the stumps accurately determined; thereby developing the fact that, no matter how great differences may exist in the apparent shapes of the crowns of individual teeth of a given class, there is a remarkable uniformity in the configuration of their necks. That is, the necks of upper cuspids, for instance, were found to have a fixed type, from which the variations were very slight as to shape, though there appeared to be no exact standard of size. So of the other classes, with the single exception of the superior molars, in which two distinct forms were found, the first being those in which the buccal roots were wider than the palatal; the second, those in which the reverse condition was found, the single palatal root being wider at its junction with the crown than the two buccal roots. The occurrence of roots of the second class being rather exceptional, the first class was accepted as the type.

The configuration of the necks of all the teeth having been determined, a set of mandrels for shaping collars to fit them was devised. The set (Fig. 1) consists of seven mandrels, six of which are double end. Their shapes are modeled upon the general typal forms of the necks of the teeth which they represent, and they are made tapering to provide for all required variations in size. The illustrations are about two-thirds actual size, the longest instruments being nine inches in length. The cross-sections show the shapes and proportionate sizes at the greatest and least diameters. The long taper permits the most minutely accurate adjustment of the collars.

Fig. 1.

Mandrels for Shaping Seamless Tooth-Root Collars.

No. 1 is a double-end mandrel, for superior molars, right and left No. 2 is a single mandrel, for superior bicuspids, right and left; No. 3 is double-end, for superior cuspids, right and left; No. 4 double-end, for superior centrals, right and left; No. 5, double-end, for inferior molars, right and left; No. 6, double-end, for the inferior centrals, laterals, cuspids, and first bicuspids, right and left; No. 7, double-end, one end for the superior lateral incisors, the other for those bicuspids in which a bifurcation of the roots, or a tendency in that direction, extends across the neck to the crown in the form of a depression on one or both approximal surfaces. The foregoing scheme comprehends all the teeth of the permanent set except the second inferior bicuspids. The necks of these approximate those of the superior central incisors so closely in shape that it was deemed inexpedient to make a separate mandrel, as the No. 4 mandrel will serve for both.

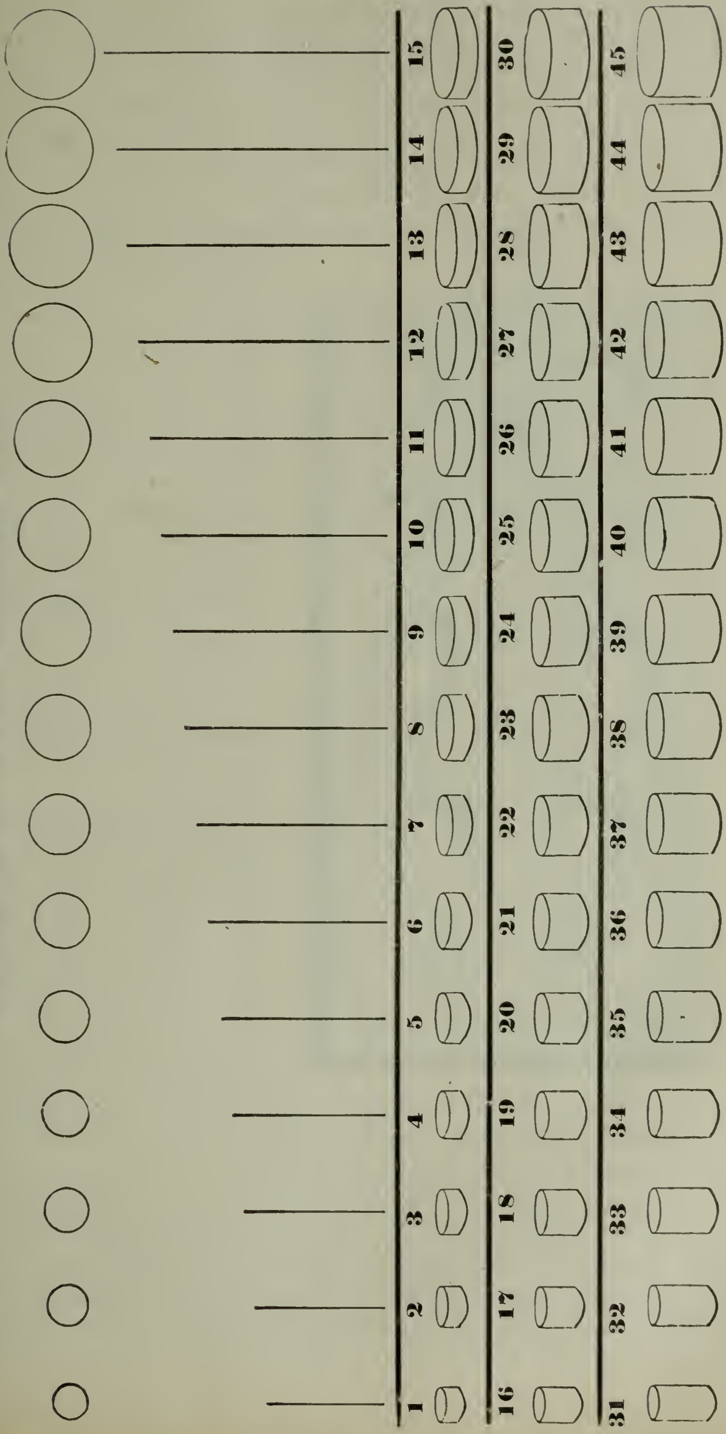
The collars or bands are made seamless, of No. 30 (American gauge) gold plate, 22 carats fine. Fifteen sizes, each of three widths ($\frac{1}{10}$, $\frac{2}{10}$, and $\frac{3}{10}$ inch) are made (Fig. 2), which it is believed will cover all requirements. These collars, although devised as a part of the system, can be used in all methods of crown and bridge-work which require bands, and possess many advantages over any others. They are really labor-saving devices, as their use saves the time and trouble of making, and there is no danger of their coming unsoldered when the pins or the backing of the crown is being soldered; and there are no hard spots to give trouble in burnishing, as, for instance, close to the root, after the collar has been shaped and placed in position, the whole surface being uniformly soft.

The seamless collars are also especially adapted to removable or detachable bridge-work. They are so constructed that Nos. 1, 16, and 31 exactly fit into or telescope with Nos. 2, 17, and 32, and so on through the entire set, each collar fits into the series next higher; so that a root may be banded with one size and the size next larger used to form the tube for the telescoping crown. Their advantages for the construction of cap crowns are obvious.

The other appliances specially devised for this system are, a reducing-plate or contractor, a pair of collar pliers, and a hammer.

The contractor (Fig. 3) contains holes which are complementary in shape to the mandrels. The mandrels being applied to the inner circumferences of the collars, while the contractor must admit the collars themselves, the short taper of the holes in the contractor necessarily covers a somewhat greater range of size than is shown in the mandrels. With this appliance collars can be evenly and accurately reduced in size at the edges, without burring or buckling. The illustration is actual size.

Fig. 2.



Seamless Collars for Crown and Bridge-Work.

Copyright, 1886, by The S. S. White Dental Mfg. Co.

The collar pliers (Fig. 4) are for contouring the collars to shape, one beak being made convex and the other concave to correspond. With this appliance the slightest changes required in the contour of the collars are easily made. About a half-inch from the extremity of the concave beak a small bar of flat steel is attached to it by means of a screw. The free end of the bar has a minute projection upon one face, the other being reinforced to fit into the concavity of the beak. In the center of the face of the convex beak is a depression, into which the projection on the steel bar strikes, making a very efficient punch for forming guards or stops to prevent the collars from being forced too far under the gum. The depression in the convex beak being slightly larger than the projection or punch, the metal is not cut through, but merely raised on the side opposite to the punch. The punch attachment being pivoted can be swung to one side when not in use.

Fig. 3.

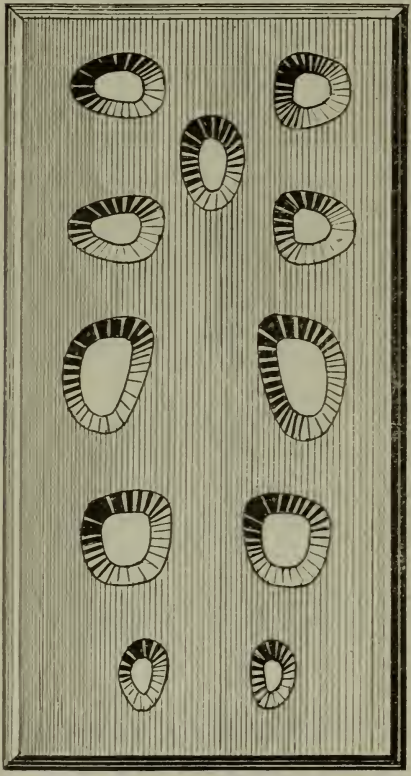


Fig. 5 is a mallet or hammer, with steel face and horn peen. The handle is 9 inches long.

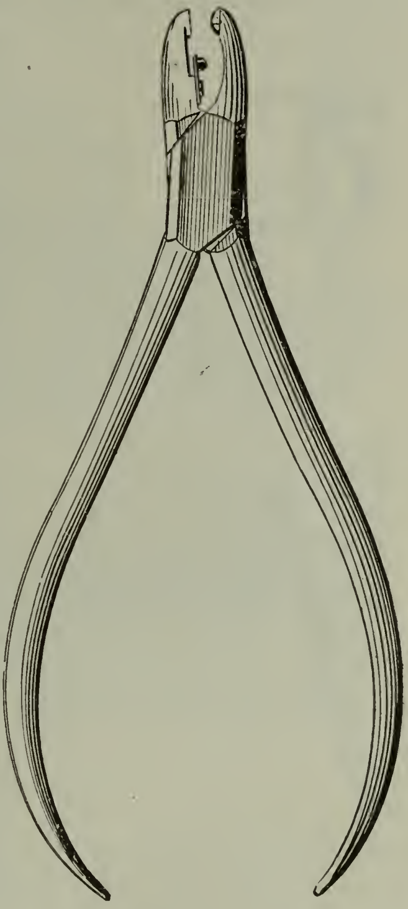
One of the appliances required is a lead anvil, which being only a piece of soft lead say 2x3 inches and an inch thick is not illustrated. The female die of an ordinary case will answer very well.

To illustrate the uses of these appliances, take a case in which the two inferior bicuspids of the left side are missing, and the crowns of the cuspid and first molar so badly decayed that the probabilities are that they will soon fall victims to the forceps. The old-time way would have been to extract the molar and cuspids, and make a partial plate. Examination, however, shows that the roots of these two teeth are in good condition, affording an excellent opportunity for the construction of a piece of bridge-work.

With a corundum point or rotary file, cut off the remaining por-

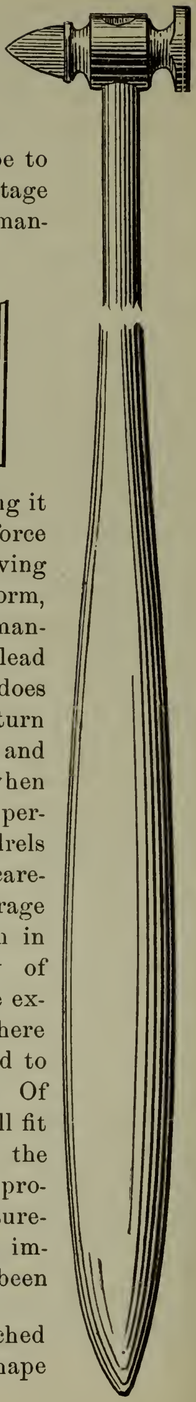
tions of the crowns level with the gum margins. Prepare the roots in any of the well-known ways, thoroughly cleansing the apical portions and filling them with whatever material is desired, being careful only that the work is well done. For the better retention of the filling-material to be placed in the pulp-chamber, retaining-grooves can be made or retaining-posts inserted. Take a piece of binding-wire (No. 26, American gauge), say $2\frac{1}{2}$ inches long, pass it around the neck of the molar stump, cross the free ends, and, holding the wire in place with one finger, twist the ends with a pair of flat-nose pliers until the wire clasps the neck closely at every point (Fig. 6). Where there are any irregularities in the contour of the tooth, it is necessary to press the wire into them with an approximal burnisher. It is obvious that the ring thus formed will show the exact size and shape of the neck of the tooth. Remove the ring carefully, lay it on the lead anvil, put over it a piece of flat metal, and with a smart blow from a hammer drive the wire into the lead (Fig. 7). Upon removing the wire an exact impression of the ring will be left in the lead anvil. (This part of the work, as indeed all others, should be done carefully as described. The wire ring may be driven into the lead by a direct blow of the hammer face, but the blow might not strike equally, and the interposition of the flat metal held level insures an even impression. A piece of an old file is best, as the file-cuts keep the wire from slipping.)

FIG. 4.



Next, cut the wire ring at the lap, straighten out the wire, and select a suitable collar by comparing the length of the wire with the straight lines in the diagram (Fig. 2) which show the inside diameters

Fig. 5.



of the various sizes. Should none of these correspond exactly, take preferably the next size smaller. It will be remembered that the collars are No. 30 in thickness, while the wire with which the conformation is secured is No. 26. This difference permits the collar when contoured to shape to enter the lead impression readily, a decided advantage in fitting. Having selected the collar, fit it to man-

Fig. 6.

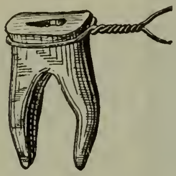
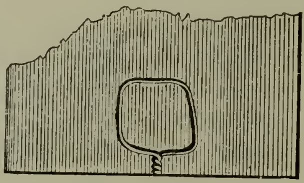


Fig. 7.



drel No. 5, with the peen of the hammer, holding it upon the lead anvil, and using a slight pushing force to help in stretching and forming it (Fig. 8). Having driven the collar to form, remove it from the mandrel and try in the lead impression. If it does not fit exactly, return it to the mandrel and stretch it a little, when it will usually fit perfectly, as the mandrels have been designed carefully to the average shapes which obtain in the great majority of tooth-necks. In the exceptional cases where the collar does not fit it can be readily contoured to the exact shape with a pair of flat-nose pliers. Of course, if it fits the impression in the lead, it will fit the neck of the tooth, always provided the measurement and the impression have been carefully made.

Fig. 8.

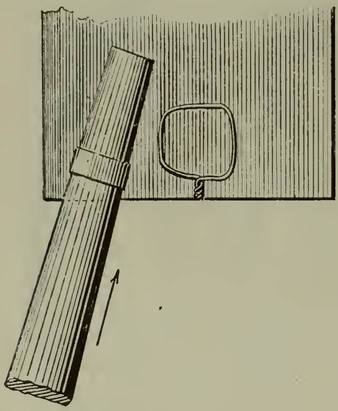


Fig. 9.

If the collar or band has been accidentally stretched too much, or if for any reason when brought to shape

it is too large, its root end can easily be reduced to the proper size by the use of the contractor. Place the edge of the collar which is to fit the root in the proper hole; hold it level with a piece of file as in taking the lead impression of the ring, and tapping lightly on the file drive the collar into the plate (Fig. 9) until the proper reduction is made. The collar is next "festooned" to correspond to the shape of the maxillary ridge. Lay it, gum edge up, on the lead anvil, and with the piece of flat file and the hammer drive it into the lead. A few cuts with a fine half-round file across the approximal diameter will conform the edges to the surface of the ridge (Fig. 10). Then place the collar in position, and, having ascertained just

Fig. 10.

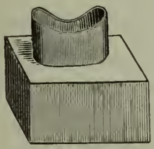


Fig. 11.

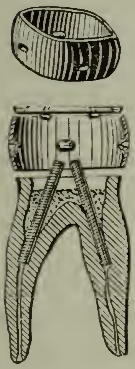


Fig. 12.

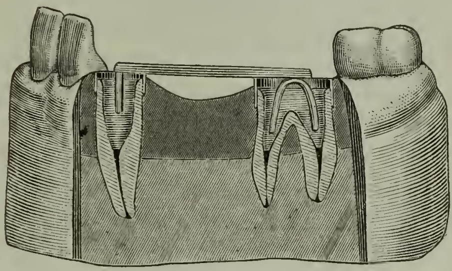
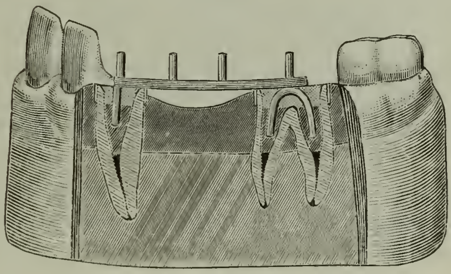


Fig. 13.



how far it should go down on the root, remove it, and with the small spring punch in the collar pliers form projections on the inside of the band at the proper points to serve as stops, which, resting on the top of the root, will prevent the collar from being forced further down upon it than is desirable (Fig. 11).

A collar for the cuspid is then fitted in the same manner, using mandrel No. 6 for shaping, after which the case is ready for the building of the bridge.

Place both collars in position and take an impression of the parts, including the interiors of the excavated pulp-chambers, from which make a cast in the usual way. Bend a short piece of half-round gold or platinum wire into the form of a horse-shoe, the two extremities of

which shall fit into the roots of the molar. Then take a longer piece of the same wire, somewhat more than enough to extend from the toe of the horse-shoe when in position to the cuspid root; bend one end of it at a right angle, or nearly so, to fit the root of the cuspid, and (cutting off any excess of length) solder the other end to the toe of the horse-shoe. The bar extending between the two roots is the truss of the bridge. Next, place the appliance on the cast (Fig. 12), holding it in position with wax, and select the teeth to take the place of the missing bicuspids and molar. The best form for this purpose is a tooth having holes extending through it vertically from the neck to the grinding surface similar to the well-known Bonwill crown.

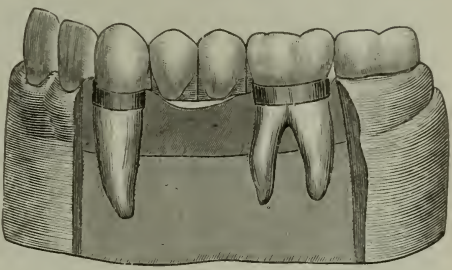
The crowns used should be large enough to fill the space rather tightly, even if their sides have to be flattened slightly to let them in. If the teeth do not fill the space tightly, a small portion of plastic filling-material crowded between them, as mortar between the granite blocks in the arch of a railway bridge, will greatly increase the strength of the work.

After the teeth are ground to fit and the proper length for occlusion is ascertained, the truss is covered with a thin film of wax, upon which the crowns are again pressed to their positions. Upon the removal of the crowns the impression of the holes running through them will be found in the wax. At these points drill holes through the bar with a small twist-drill run by the engine, and into these fit and solder the pins for the support of the crowns.

The bridge is now ready to be attached permanently. Set the crowns in position upon their supporting pins to secure the proper alignment. (If the operation were upon the upper jaw they would have to be held with wax.) Put into the canals of the supporting roots (the cuspid and first molar) a sufficient quantity of some quick-setting plastic, as oxyphosphate, to about half-fill the pulp-chamber, but not enough to prevent the supports of the truss from being forced home. Force the bridge supports to place, and after allowing the filling-material to become set remove the crowns. Fill the remainder of the pulp-chamber and the whole of the collar with gold or with amalgam, gutta-percha, oxyphosphate, or any suitable plastic (Fig. 13). Set the crowns permanently, the molar and cuspid first, as this affords greater facility for the trimming off of any excess of the filling-material used in the attachment. For attachment of the crowns, gutta-percha is probably the best material, as crowns set with it are readily removed for the correction of any inaccuracies of occlusion or alignment, by grasping them between the beaks, previously warmed, of a pair of universal lower molar forceps. The heat warms the gutta-percha and releases the tooth, which can then be re-set properly. In attaching crowns with gutta-percha the holes

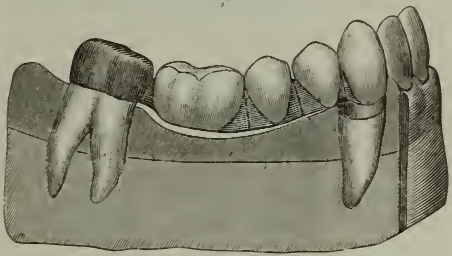
in the crowns are first filled with the material, after which the crown is warmed and forced to place. Any of the other plastics ordinarily used in setting Bonwill crowns can be employed, at the discretion of the operator. Fig. 14 shows the case completed.

Fig. 14.



In securing the occlusion of a piece of bridge-work it is well to make the artificial teeth a little short, so that the natural teeth on both sides will meet the first shock of mastication. Nature will correct the occlusion in time by slightly elongating the roots supporting the bridge. If the artificial crowns are permitted to strike the natural teeth from the first, the undue strain upon the two supporting roots may cause soreness and perhaps more serious consequences.

Fig. 15.



When a sound tooth is to be used as one of the supports of the bridge, a modification of the method just described is necessary. Take a case where it is desired to bridge the space caused by the loss of the right inferior bicuspids and first molar. The crown of the right cuspid is nearly gone, but the root is sound and capable of supporting one end of the bridge. The other end will be attached to the second molar, which is a sound tooth. Prepare and band the cuspid root as before; dress off the second molar crown until it is slightly smaller than the neck, so as to permit a cap to be telescoped over it, and take the measure of the crown with the binding-wire. Select a suitable seamless collar of sufficient width to extend from the neck to a little beyond the grinding surface, and drive it up on the proper mandrel to get the general shape, but not the full size required to fit the tooth, leaving it so that the edge having the larger circumference will just pass over the end of the crown; place the collar on the tooth, and with a block of wood and the mallet tap it to place just beyond the free margin of the gum. This method will make a close fit, as the collar will readily stretch all that is necessary. With a sharp-pointed instrument mark the length of the crown, remove the collar, and cut it to the proper width as indicated. Then in a piece of gold plate of

the thickness used for caps form four little depressions of the general character of an impression of the molar cusps. An easy way to do this is to lay the plate on the lead anvil; then with the ball on the end of an ordinary socket-handle and the hammer the depressions are made in a moment. Set the collar on the plate, borax it, charge with solder, and heat till the solder flows. Cut off the surplus plate, and a perfect cap for the molar is made. Place it on the tooth and take an impression, and thereafter proceed as before directed to make the truss of the bridge and mount the teeth, except that in this case the posterior end of the truss is to be soldered to the molar cap. For the final attachment place a little oxyphosphate or any other plastic filling-material in the cap to secure it firmly (Fig. 15), first cutting a slot in the crown end of the cap for the escape of the excess of material. Pressure upon the filling-material hastens its hardening.

Detachable Bridge-work.

A description of two or three methods of constructing detachable bridges will suffice to indicate the general principles involved. Having these, each operator will find it an easy task to devise the modifications necessary to adapt a method to individual cases.

The first method is especially applicable to cases where both ends of the bridge are attached to roots,—as, for example, the inferior cuspid and second molar roots of the right side, the intervening teeth having been lost. The operation is conducted as described in the first case of fixed bridge-work down to the construction of the truss, for which in this method square gold wire is used. Having cut the wire of the proper length, lay it upon a piece of gold plate (about No. 26, American gauge) of the same length and full three times as wide, and, placing the two upon the lead anvil, with a hammer and the piece of file before used drive them into the lead. This will form the plate into what we may call an open trunk which fits the square wire. Remove the two from the lead together, and, without separating them, curve to the proper shape to form the truss. Grind crowns having vertical holes, like the Bonwill, to fit, and having determined the proper points for the supporting pins (see page 486) drill through both trunk and bar at these points. Separate the bar from the trunk, and fit and solder pins to the bar. Construct small tubes to fit the pins, ream out the holes through the trunk to admit them, and set the tubes with solder in the enlarged holes (Fig. 16.) Fix the crowns permanently upon the tubes. They may be mounted in any of the approved ways, by vulcanizing or by the use of a plastic filling-material. When they are firmly set, place the

trunk with the teeth upon the bar, and anchor permanently as already described. Fig. 17 shows the completed work.

In this method the truss consists of the bar and the open trunk which covers three sides of it. The bar is of course permanently attached to the roots of the molar and cuspid, but the trunk with the teeth can be removed at any time.

The second method of constructing a detachable bridge is applicable to cases where one or both of the supports or piers are sound teeth. In the case adduced for illustration the right inferior cuspid crown was decayed, and both of the bicuspids and the first molar were absent. The supports for the bridge were the sound second molar and the cuspid root. After the cuspid root was prepared and banded, the crown of the molar was reduced very slightly,—not sufficient to destroy the enamel, but just enough to permit a collar properly fitted to pass over it. A collar somewhat wider than the length of the crown from grinding surface to neck was fitted and cut to the proper width. Two lugs were then soldered upon the anterior and posterior sides and bent to fit into the approximal fissures, which were slightly cut out to admit them. An impression was taken, the collar coming away in the plaster, and a cast was made with the collar in position. A coned tube was then made for the root of the cuspid and a coned pin fitted into it. A truss of half-round wire was made, to which the coned pin and the molar collar were soldered (Fig. 18). A half-clasp to grasp the lateral was next soldered to the end of the truss to be supported by the cuspid. The object of this clasp was to guard against the teeth being thrown out of proper alignment by the force of mastication. Bonwill crowns were then vulcanized to the truss, after their supporting pins had been fitted and soldered to it. (Counter-

Fig. 16.

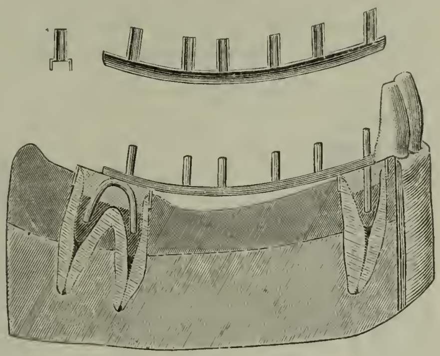
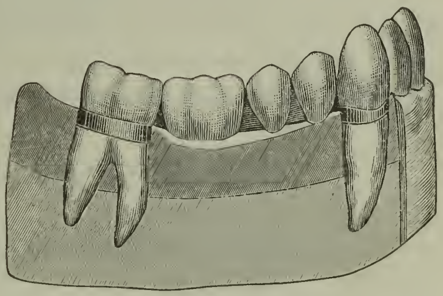


Fig. 17.



sunk crowns can be used as well in the same way. Plain plate teeth may also be used in this style of work, in which event they are to be soldered to the truss.) The bridge was then ready to be set, which was accomplished in the following manner: The cuspid root was nearly filled with oxyphosphate, and the coned tube was placed upon the pin. The band was put on the molar, and the coned pin with the tube upon it was forced into the plastic in the cuspid. As soon as this became set, the tube was held permanently, while the bridge itself could be removed whenever desired (Fig. 19).

This method of fixing the tube allows considerable range in its adjustment. In soldering the coned pin to the truss, care should be

Fig. 18.

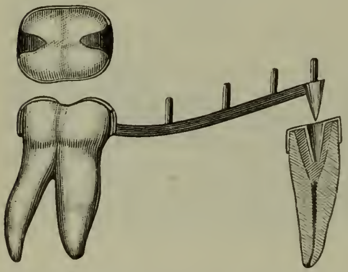
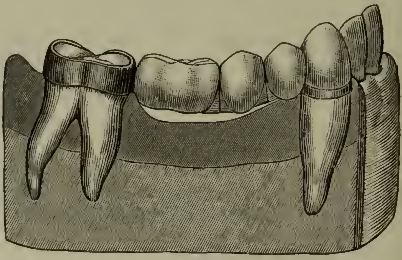


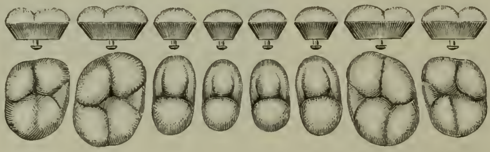
Fig. 19.



taken to set it at an angle exactly parallel to the axis of the molar; otherwise there will be difficulty in removing the bridge.

The third style of detachable bridge-work to be described involves the use of cusp crowns (Fig. 20) for supporting posts or piers. Suppose a case similar to that described at page 488, where a bridge is required to extend from the right inferior cuspid to the right inferior second molar, with only the roots of the two teeth named as supports. Prepare the roots and pulp-chambers. Set screw-posts into the dentine for anchorage or as retaining-pins, and fit the collars, using

Fig. 20.



sizes wide enough to form the walls of the crowns. Fill the pulp-chamber and about two-thirds of the depth of the collars with a plastic filling-material, packing it well around the retaining posts. Select suitable cusp crowns for the molar and cuspid and place them in the ends of the bands to ascertain the occlusion. If too long, shorten the cusps or reduce the bands with engine corundums or rotary files, and when the correct articulation is found form a small square shoulder in

the lingual edge of the cuspid and in the posterior grinding surface of the molar. Fill the remaining portion of the collars with plastic mixed somewhat thinner than the first lot, and set the cusp crowns in position. If there are antagonizing teeth the mere closing of the patient's jaws will force the crowns to place. If there are no antagonizing teeth the crowns can be readily tapped to place with the mallet, using a piece of wood as a driver. Allow the filling-material to set firmly, trimming off any excess which may exude around the collars.

Bridge supports or piers constructed on this plan are strong and durable, and likely to withstand any strain. Take an impression, and proceed to fit seamless collars to telescope over those already set upon the cuspid and second molar roots. It will be remembered that these collars are so made that each size telescopes

FIG. 21.

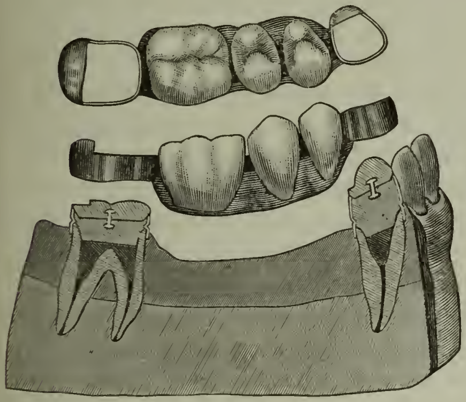
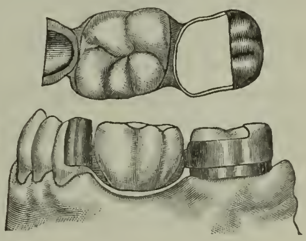


FIG. 22.



into the next higher series. If the proper sizes are selected for the outside or female bands, the work of fitting is readily and quickly accomplished, forming tubes which slide easily over the supporting piers, and at the same time fit closely. It is only necessary to take care in shaping the tubes not to drive them too far up on the mandrels and thus stretch them so as to destroy the fit. To the outer end of each of the tubes solder a small piece of gold plate, forming partial caps so placed as to rest when in position upon the shoulders previously cut in the cusp crowns. Adjust a truss bar of half-round gold wire, to the ends of which solder the tubes (Fig. 21). The truss is now ready for the teeth, which may be of any of the forms used for this purpose, and they may be attached to the bar in any way desired. One of the strongest attachments is vulcanite.

An easy modification of the plan just described is readily adapted

to cases where only a small space is to be filled and one end of the bridge is to be supported by a sound tooth. Thus, suppose it is desired to bridge a space formerly occupied by the two inferior left bicuspids, the crown of the first molar being a mere shell. The operation would be essentially the same as in the previous case, except that the sound cuspid would be utilized for one of the piers as follows: Fit a seamless collar, cut out a portion of it so that it will embrace only about two-thirds of the cuspid crown, and solder a partial cap or cover to it, as illustrated in Fig. 22. Or, if deemed preferable, the cuspid may be separated from the lateral incisor with the corundum disk and the collar allowed to embrace the whole crown.

The great desideratum in constructing a piece of bridge-work is, of course, the securing of perfect usefulness in mastication and speech, combined with absolute comfort and cleanliness. The closer a bridge approaches that condition where its wearer loses consciousness of its presence in his mouth, the nearer perfection it is. Scarcely less important, however, is the necessity of providing for repair. Accidents will occur, and the system which superadds to usefulness, comfort, and beauty, ready facility for repairing breakages is by so much superior to those which make no such provision. A crown broken from a bridge constructed by any of the methods above described can be easily substituted, and the piece when repaired will be as strong and serviceable as it was originally.

It has not been deemed necessary to detail the construction of a

Fig. 23.

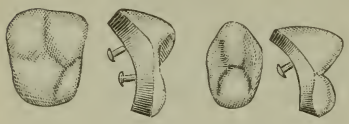
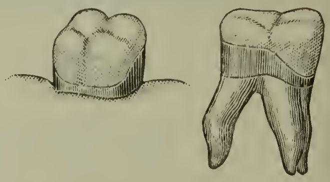


Fig. 24.



single crown separately, as all the steps are included in the building of bridges, which have been described minutely. Porcelain cusps of the general form illustrated in Fig. 23 have been designed specially for these cases. In mounting them the gold band is cut away on the buccal side as shown in Fig. 24 to permit the porcelain to show.

NEW FORMS OF ARTIFICIAL CROWNS.

BY HORATIO C. MERIAM, D.M.D., SALEM, MASS.

(Read before the New York Odontological Society, May 11, 1886.)

Whatever our opinion regarding the value of scientific contributions (microscopic, chemical, etc.) to our professional knowledge, we must admit, I think, that our profession is practiced largely as an art. I do not propose to undervalue this, nor would I take from the credit due those who so patiently labor to place dentistry on a basis of scientific accuracy; but choose rather to emphasize the importance of both. The scientific and the practical should go hand in hand.

The feeling that we should not describe in our journals the many ingenious contrivances and methods which are of so much use to us individually has kept many a practical man from doing the one thing that he could for the good of the whole. Certain it is that, until we change our practice in this matter, we shall be at the mercy of the patent fiend. While we may well be astonished to learn that patents are granted for many trivial things, and vexed that some one has patented a long-used method or contrivance, I ask how, until we publish and illustrate these things, can those in authority at the Patent Office learn that they are or have been in use? Outside of things made and advertised for sale, they would find but little.

This is my only apology for presenting to you to-night this well-worn subject. I may mention, however, that I have no desire to be ranked among the crowned heads of America, the forms I give being a study of the subject; nor do I come before the New York Odontological Society this evening with patent methods or proprietary rights.

The value of modern crown-work rests, first, on the success of root-filling. Those who stand in terror of "dead" teeth may well let it alone, for the lack of courage and skill that prevents the saving of a pulpless tooth will also cause failures with tooth-crowns.

The forms of ready-made porcelain crowns offered us in the depots are at present faulty in that strength is sacrificed to construction. The Foster and Bonwill crowns both fail us here. They are ingenious, but to secure a fit it is usually necessary to grind them so much that the construction is encroached upon, and substance is wanting. It must be remembered that nothing is stronger than its weakest part. The space allowed for the nuts in the Foster crown is much too large. We must remember, however, that this crown was offered before we had the modern cements, or the profession in general had appreciated gutta-percha. We need a crown that can

be ground on its sides as well as against the root, with a straight hole through it, similar to that of the English tube teeth, excepting that the hole should come out at a greater distance from the cutting edge in the incisors and cuspids. After the crown is ground, to place the hole through, it may be formed as we desire with a copper drill and corundum, or with hard-rubber points dipped in corundum.

Just before starting I received from Dr. Flower, of Pittsburg, Pa., some drills which he states will drill porcelain readily. They reached me too late to be tested, but may prove of value. With the drills I show a tooth that he drilled with one of them.

There are now made, for use in machine-shops, wheels the corundum of which is united with a flux, and baked at a temperature of nearly three thousand degrees. These wheels hold a true edge, and when made small enough will be a great step in advance of what we have. I have had small points made in this way, with which I can grind out a crown to any of the forms illustrated in Fig. 1.

I now show you some of the different varieties that can be made by grinding the crown just referred to (Fig. 1), the advantages of

Fig. 1.

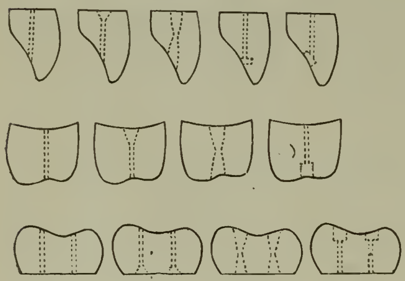


Fig. 2.

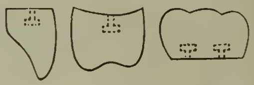
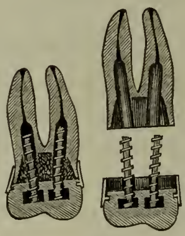


Fig. 3.



which have already been stated. With these crowns it is expected that dowels will be used, set in either cement or gutta-percha.

We will now pass to forms which are to be secured by metal bands fitted either to the root or to the crown itself (the strongest, of course, being held at their periphery), and I will detail my method of applying the same, for it enables me to avoid the trouble and delay of investing or soldering. For these the crown given in Fig. 1 may be used, as well as those shown in Fig. 2.

The band is fitted to the root, and the crown ground into the band after proper occlusion with its antagonist has been obtained. If a molar, a fine groove is ground around it, and the band, after being corrugated on its inner surface with a small lining bur, is

placed on a lead anvil and the tooth driven into it, thus partially securing the advantage of union by gomphosis. The common glass stopper is a good illustration of how little more than its fit would be required to retain it firmly in place. For this little I have drawn on the tube-teeth workers of England. A few small pieces of sulphur are then placed inside the band, and all held over a small flame until the sulphur melts and flows into the groove between the band and the crown. Zinc phosphate may be used before the crown is forced in, or some flux—borax, for instance, which melts at a low temperature, though this would probably require investing. We then have a crown which, if a molar, I do not fear to attach with gutta-percha without dowels; but others may not have this confidence, and dowels may either be put into the roots or set in the crown with cement, and afterwards secured to their places in the root as usual (Fig. 3). It is evident that if cement is strong enough to hold a dowel in the root it must be equally serviceable in securing the crown to the dowel. Some like the hardest way best. These may fit a fine platinum or pure gold wire into the groove around the crown (Fig. 4). Drive in as before; invest and solder (Fig. 5). A gold amalgam

FIG. 4.

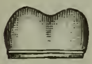


FIG. 5

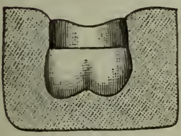


FIG. 6

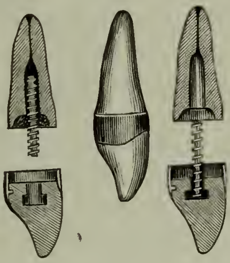
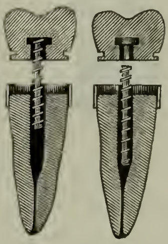


FIG. 7.



may be used, such as was employed by old plate-workers for banding a plate over the teeth. I have not tried this, but suggest it as of possible use, the dowels being put in as before. For the incisors the groove should not run around the anterior face of the crown, and I have not soldered these teeth in (Fig. 6). I have entire confidence in any form for the incisors and bicuspids where the root is well banded, the dowel put into the centre, and the crown forced to place in gutta-percha (Fig. 7); while for the molars, if quite short, I do not care for the dowels. You will notice that this method does away with much of the showing of gold in molars where such a result is desired (Fig. 8).

When cohesive gold was first used we thought nothing could be more beautiful,—the more conspicuous the better,—but we gradually learned that the perfection of art was to conceal art. So it is

with tooth-crowns, and we shall learn soon to omit great backings, etc., wherever possible; not only because they are conspicuous, but because a tooth backed up by any substance is no longer translucent.

I will present one more form for molars, and although it shows more gold than any of the others, it is perhaps the strongest of all. The band is made full width down to occlusion, and any large, strong tooth is ground to fit the space to be filled in the arch. This is driven into the band so as to be even with its edge; cemented with sulphur as before, and I think we have a crown that is made for all time (Fig. 9).

FIG. 8.

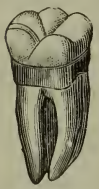
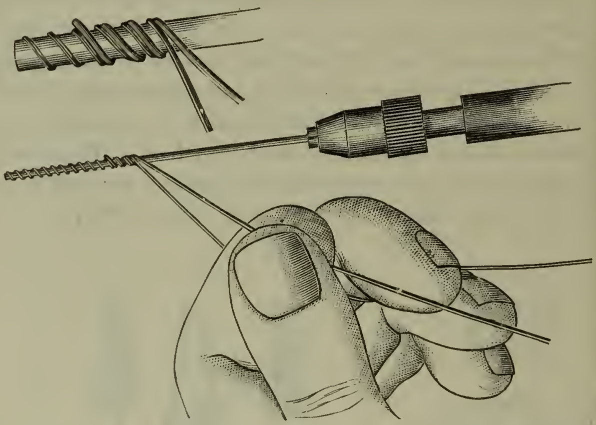


FIG. 9.

FIG. 10.



Setting.—I first varnish the band inside with Canada balsam dissolved in ether; then fill the crown with gutta-percha and crowd it up against the root several times to get an impression. When sure that I have the right amount of gutta-percha, I place the dowels in the root (if I am to use them); heat the crown; dip it into cajeput or any essential oil, and crowd it to place. The dowels I fit in the same way, wrapping them with gutta-percha and working up and down in the root until I get the impression before the final forcing to place. I thus have the advantage of the dowel and hard centre of gutta-percha to act as a plunger, and the soft, semi-dissolved gutta-percha comes back on the outside of the mass, forming, I think, the tightest root filling known. I fill roots in this way with gutta-percha points when I do not use a dowel. The dowels used are made by wrapping a piece of platinum and iridium wire with about one-third of a sheet of gold foil, which is melted on and the combination made true by being drawn once through a wire gauge. A piece of piano-wire is then wound around it three or four times to serve as a guide, and a fine platinum wire, previously drawn square, is caught and turned through

the wire-guide a few times, when the winding may either be finished by hand, or the end, after being started, may be placed in a lathe-chuck and wound up at once (Fig. 10). A piece of gold foil is then wrapped around the whole and the fine wire soldered on. A dowel made in this manner is not strained by having its thread cut, and the thread, being square and coarse or fine as you wish, is strong and possesses plenty of grip. I recommend it to our friend, Dr. Farrar.

Fig. 11.

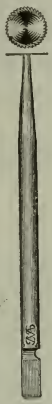
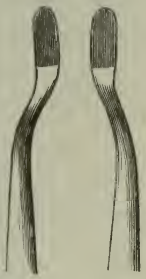


Fig. 12.



Should these forms prove as valuable as I hope, those at a distance from the cities, without gas, will find that the labor of crowning roots has been much lessened.

When a root has broken off far under the gum it should be filled with gutta-percha, and a temporary plate worn—if the loss be in the front of the mouth—until the root works down, when it may be crowned and the plate given up.

In preparing roots after a large portion of the crown is broken away, I enlarge the pulp-chamber with a large, round bur, and, when even with the gum, follow with the revolving saw here shown (Fig. 11). With this saw I often cut off the remnants of a crown from the inside without wounding the gum or drawing a drop of blood, and am saved the unpleasantness of running a stump corundum wheel in the mouth The outside of the root can sometimes be formed with the instrument here shown (Fig. 12).

REMOVABLE BRIDGE DENTURE.

BY R. WALTER STARR, D.D.S., PHILADELPHIA, PA.

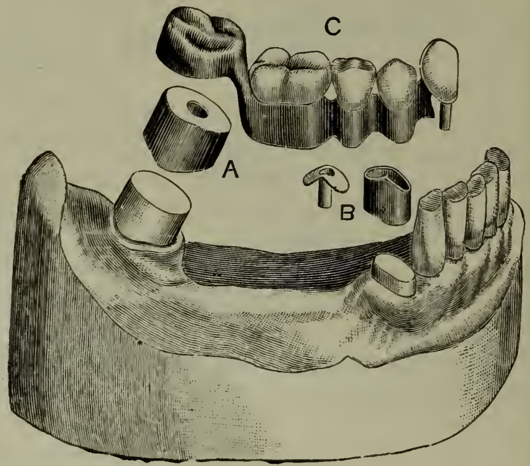
A case presenting unusual difficulties was the recent occasion ot an adaptation of the method I described in the April number of the Dental Cosmos, to which reference is made for details not essential to this record. The forward overhang of the inferior right second molar was so excessive that an impression could hardly be taken, even piece-meal, until with corundum wheels and points the sides of the tooth had been made parallel, or rather slightly tapering, to form a truncated cone, with the neck as a base. The molar was alive and sound, but the crown was gone from the pulpless cuspid, which I suitably shaped by means of the peculiar root-trimmers shown by Fig. 1. For shaping superior roots I have designed the pair of straight trimmers shown by Fig. 2.

An impression was then taken, the cast from which is illustrated by Fig. 3. A seamless gold collar was, by means of a slightly tapering mandrel, made to exactly fit the tapered natural molar, the lower edge of the collar cut to conform to the gingival margin; a cap piece of gold plate soldered to the top edge of the collar, and a hole drilled through the center of the completed cap (A, Fig. 3). Care was taken to so fit and proportion the cap that it would require finally pretty hard driving to send it home on the tooth; but first there was fitted to the cap a telescoping seamless collar, on which was soldered a gold plate, with cusps, to form a molar crown as shown in Fig. 3. The molar was then thoroughly dried, slightly painted with Agate cement, and the cap, A, driven hard down with a flat pine stick held upon it and struck with a mallet; the hole in the cap

FIG. 1.

FIG. 2.

FIG. 3.

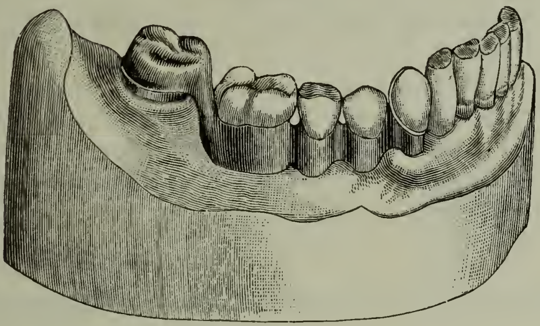


enabling me to see when the cap was quite down. The cuspid was then likewise fitted with a seamless gold collar, the top edge of which was given a roof-shape, as seen above the root in Fig. 3. A piece of gold received a corresponding roof-shape, had a short section of gold tubing soldered into it, and was trimmed to the outline of the collar, beside which, B, Fig. 3, its form is seen, and to which it was subsequently soldered, after suitable investment to keep the parts in proper place. The root-canal had been previously prepared to receive the tube, which, with its roofed cap, was with stick and mallet driven hard down over the root. A piece of gold wire exactly fitting the tube had a roof-shaped piece of properly-perforated gold plate slipped over it into position on the root; became fixed in such relation by a drop of melted hard wax; was removed, invested,

soldered, and finished in such shape that, excepting the hollowness, it looked like the tube and cap B, Fig. 3.

The relations of the occluding teeth had, of course, been determined by an articulating model, and by means of it a series of seamless gold collars and cusp-crowns were adjusted on a thin platinum plate fitted on the cast between the cuspid and second molar, and the collars soldered to the plate after investment in the manner previously described in the DENTAL COSMOS (see page 210). The truss thus formed received an appropriate finish by the rounding and smoothing of its basal borders. A plain plate cuspid was backed with gold plate and fitted on the roof-plate, to which, after determining its proper occlusion, it was secured by hard wax; removed, invested, and soldered. It was then put into the tube on the root; the telescoping cap put over the molar; the truss put in position in the mouth, and the whole covered with plaster and sand, contained in a

FIG. 4.

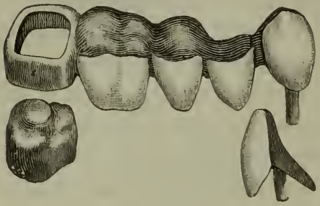


suitable sectional impression cap, which enabled me to hold the mass steadily in place until the mixture was sufficiently hard to bring away cap and truss and roof-plate all in proper position. A second mixture of plaster and sand, and a suitable trimming of the first mixture after all was hard, sufficed for the soldering process that resulted in the denture which, when finished, appeared as shown detached at C, Fig. 3, and mounted on the cast in Fig. 4. It went firmly to place in the mouth, and yet was removable in the possible event of accident to the denture, or for readjustment of the cusp-crowns, which latter could easily be done by warming the piece sufficiently to soften the gutta-percha, replacing the denture on its anchorages, and directing the proper closure of the occluding teeth.

The ultimate success of this class of work depends wholly upon the character of the preliminary treatment, the absolute precision of fit and adjustment on the anchorages, and the proper adaptation of the denture to its base and to the occluding teeth.

Dr. C. M. Richmond, of New York City, in making removable dentures of the entirely soldered kind, employs a zinc die made from a cast of the anchor tooth with its cap on. He makes of crown metal (platinum faced with gold) a collar somewhat smaller than the tooth-cap, and deep enough to reach from the gum to about a sixteenth of an inch above the cap. He then drives the die into the collar so far that the extra sixteenth of an inch can be hammered over and burnished down on the die-end to form a flanged collar. Outside of this, in the same manner, he forms another flanged collar, and then solders the two together, thus obtaining a close-fitting, stiff collar, that will not stretch in being telescoped on and off the anchorage, and is kept by the flange from being forced too far over the tooth-cap. A denture of this kind is illustrated in Fig. 5, which also shows his post and roof device in another form than that previously described.

Fig. 5.



It may be well to add that, in the use of an impression cup for holding the plaster and sand around the parts to be subsequently removed from the mouth, the *inside* of the cup should first be slightly oiled, to allow a separation of the cup when the mass is being prepared for the soldering.

METHODS OF MOUNTING THE LOGAN TOOTH-CROWN.

BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

As a condition precedent to the preferred procedure in permanently placing an artificial tooth-crown on a natural tooth-root, it is assumed that the root will have been properly treated, and the pulp-canal tightly filled at its apical portion. Such suitably prepared root or roots will, therefore, in all cases be instanced as subjects for the reception of Logan crowns in the following illustrated description of the best methods of mounting them.

Fig. 1 shows a superior right central root, an end appearance of the same, and a Logan crown, front view. Fig. 2 exhibits, at a right angle to the plane of the first figure, the same root, its end, and the Logan crown, side view. In both figures the pulp-canal is supposed to have been first drilled to a gauged depth with an engine twist drill, No. 151, and then enlarged by means of a fissure bur, No. 70, to the tapering form shown; the walls being subsequently grooved with an oval bur, No. 90. The enlarged section, Fig. 3, shows the crown adjusted on the root by means of cement or

gutta-percha, which surrounds the post and fills all the spaces in the root and crown. Fig. 4 shows the completed crown. Fig. 5

FIG. 1.

FIG. 2.

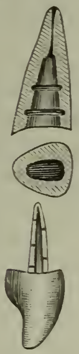


FIG. 3.

FIG. 4.

exhibits a bifurcated bicuspid root, its end appearance, and a Logan crown adjusted to the root. Fig. 6 illustrates the best manner of bending the post. Fig. 7 shows a split post, and its adaptation

FIG. 5.

FIG. 6.

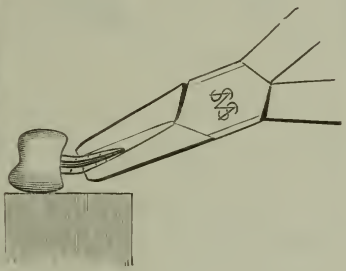


FIG. 7.

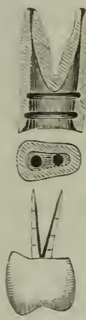


FIG. 8.

to a bifurcated bicuspid root is seen in Fig. 8. Figs. 9 and 10 exhibit the mode of mounting the Logan crown on a superior molar

FIG. 9.

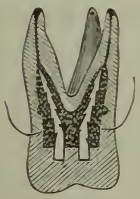


FIG. 10.

FIG. 11.

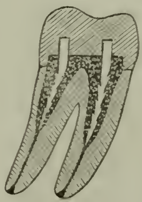
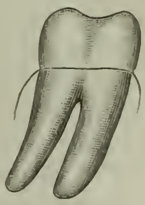


FIG. 12.



root, and Figs. 11 and 12 the same crown in its relations to an inferior molar root.

In the light of the preceding descriptions the figures clearly present to the mind's eye of the expert dentist the essential features of the new Logan crown and the method of mounting it; yet further explanation with reference to the figures will perhaps prove serviceable to such as may not be familiar with all the details of root-crowning.

In every instance where a root is deemed ready to receive its filling, it should first be measured through its canal from the cervical opening to the apical foramen, and this may be accurately done with a gauge adjustable on a delicate canal explorer, Fig. 13. The same

Fig. 13.

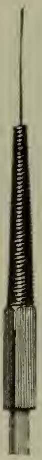


Fig. 14.

Fig. 15.

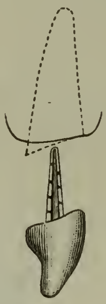


Fig. 16.

Fig. 17.

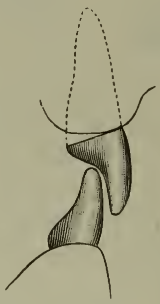


Fig. 18.

device serves to measure the distance from the apex to which the canal should be then filled (Fig. 14). It also gauges the depth to which the drill may be carried. The proper degree of enlargement from the bottom of the drilled hole will, of course, depend on the observed size and character of the root, and every dentist should familiarize himself with generic tooth-forms, so that when the length of an incisor, cuspid, or other tooth-root is known, he can so nearly determine its hidden outlines as to form with precision a corresponding enlargement of the pulp-canal such as is shown by the several cuts. The suitable preparation of the bifurcated roots of some bicuspids and of all the molars is a matter involving difficulties and judgment of an unusual character. An instance of the feasibility of splitting the post of a Logan crown to adapt it to the bifurcated root of a bicuspid is shown by Figs. 7 and 8. This example directs attention to the peculiar shape of the new post,* in which

* The writer disclaims any credit for its invention.

there is effected such a distribution of its metal that its greatest strength is in the line of the greatest stress that will in use be brought to bear on the crown, while the least metal is found at the point of the least strain; the applied part of the post being in outline nearly correspondent to that of the root itself. The pulp-canal is likewise conformably enlarged to receive the largest and stiffest post compatible with the size and shape of the root to be crowned.

The fitting of a Logan crown to a root is best done by the use of a wet stump wheel in the engine hand-piece, which affords the greatest facility for the slight touches required to abrade the thin cervical borders of the crown, which may thus be made without encroachment on the post.

By the old method of adapting pivot teeth to roots, the close fitting of the crown precluded the use of a plastic packing, because its thinness over the surface of the joint made such packing liable to break loose under the shock and strain of use. The recess in the Logan crown obviates this defect by providing a receptacle for a considerable interior body of cement that will be deep enough to be self-sustaining internally, and yet allow the peripheral portions of the root and crown to approach each other so closely that, though only a film of packing remain, it will still be strong enough to insure the persistent tightness of the joint. Such annular boss of cement when formed of amalgam also adds strength in some cases to the mount.

When enough of the natural crown remains, it is well to leave standing some of the palatal portion, and cut the root under the gum-margin at only the labial part, as shown by Fig. 15. Thus, the labial joining of the root and crown will be concealed, and the other parts of the joint will be accessible for finishing and keeping clean (see Fig. 16). The Logan crown may be ground until a large part shall have been removed for adaptation to the occluding tooth or teeth without greatly impairing its strength (see Fig. 17). This crown also in such cases maintains the translucency which is one of its peculiar excellences, owing to its solid porcelain body, and the absence of a metallic backing or an interior largely filled with cement or amalgam.

The distal buccal root of the natural superior molar is in nearly every instance too small to receive a post of any useful diameter, and therefore the Logan superior molar crown has but two posts, which, like those of the inferior molar crown, are square, and thus may be easily barbed, as may also the ribbed posts of the crowns for the anterior tooth-roots. These posts are in all the Logan crowns large enough to answer in any given case, and can of course be easily reduced to suit thin or short roots.

Any of the cements or amalgams may be used in fixing these crowns, but good gutta-percha, softened at a low heat and quickly wrapped around the heated crown post, which is at once seated in the root, forms the best mounting medium, and has the great advantage of permitting a readjustment, or if need be the ready removal of the crown by grasping it with a pair of hot pliers or forceps, and holding it until the gutta-percha is sufficiently softened.

An excellent combination for some cases is accomplished by fitting a narrow seamless gold collar over the neck of a root prepared like that of Fig. 6, and then adjusting and mounting in the manner described a Logan crown, with the result shown by Fig. 18.

ONE WAY TO SPLICE A BROKEN TOOTH.

BY E. A. BOGUE, M.D., D.D.S., NEW YORK, N. Y.

Some five years ago a lady had the labial surface of an upper bicuspid split entirely off, from the central depression to just below the gum. The pulp was alive and well, but the tooth presented a most unsightly appearance. The means adopted for remedying the difficulty were suggested by the case itself. I have used the same device a number of times since with great satisfaction, sometimes even instead of pivot teeth. A cuspid plate tooth with long pins was chosen. With a minim corundum stone a socket was ground into the broken tooth just above the margin of the gum, into which socket the thin upper edge of this porcelain tooth could fit. After the porcelain tooth was fitted to its place and properly shaped, a strip of gold plate one-sixteenth of an inch wide was soldered across from pin to pin like a bridge, leaving about one-sixteenth of an inch between it and the tooth. (See Fig. 1.) The loop thus formed was

Fig. 1.

Fig. 2.

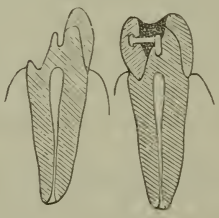


Fig. 3.

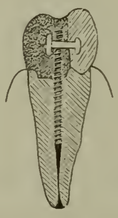
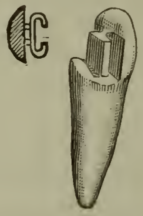


Fig. 4.



fitted over a projecting portion of the dentine, and a slot was ground into the dentine to receive it. (See Fig. 2.)

A little dove-tailing slot was also ground in on either side of the remaining dentine. A ring of very thin platinum was then made, nearly as broad as the length of the tooth crown. This ring was placed around the broken natural tooth, the upper edge passing just

beneath the gum. The porcelain tooth was then placed inside the ring, which held it steadily in position, the loop passing over the projection of dentine. The pressure exerted by the porcelain tooth was sufficient to fill out the ring in all parts and adapt its thin edges to the varying size of tooth and root.

This ring, serving as a matrix, was then filled with amalgam, malleted in around the pins and dovetails in the natural tooth. Upon cutting the ring off the next day and polishing the filling, I found all sensitiveness had disappeared, and with the restoration of a perfectly natural appearance of the tooth and its contour, I had a serviceable organ, which has continued to do duty ever since. In cases of pulpless teeth I have inserted a gold and platinum or platinum screw firmly into the root, and passed the loop formed by the two pins and the cross-bar over the screw, thus adding greatly to its strength. (See Fig. 3.) The amalgam, properly mixed, has no surplus mercury to attack a gold and platinum screw. I have replaced in this manner quite a number of teeth that were broken off level with or below the gum. By passing the drill through the loop of the porcelain tooth held exactly in the desired position, when drilling the hole for the screw, a most accurate adaptation can be obtained. An incisor can be made irregular to lap over its neighbor, and be varied otherwise to simulate the freaks of nature. A bicuspid root can be dovetailed inside the flattened pulp chamber. The amalgam driven into this dovetail not only helps to retain the screw in position, but prevents its unscrewing, and assists in supporting the crown, and all this in a cleanly and inoffensive manner. In cases where the break in the natural tooth is not extensive, especially where it does not pass below the gum, phosphate of zinc may sometimes be used with advantage in this process. But this is seldom advisable, on account of the unreliable character of the material.

The bridge from pin to pin may also be shaped to lock in the dovetail slots previously mentioned, employing likewise the ring as a matrix for the amalgam investment. See Fig. 4, in illustration of the plate tooth and natural tooth thus prepared.

PROCEEDINGS OF DENTAL SOCIETIES.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Tuesday evening, March 2, 1886, in the rooms of The S. S. White Dental Manufacturing Co., Broadway and Thirty-second street.

The president, Dr. William Carr, in the chair.

Dr. C. F. W. Bödecker, chairman of the Clinical Committee, reported as follows:

Mr. President and Gentlemen: We have had a very lively clinic to-day. The attendance was over ninety persons. Dr. John J. R. Patrick, of Belleville, Ill., illustrated his method of making metallic artificial crowns. Dr. Patrick had forty-eight different shapes and sizes for molars and bicuspids of the upper and lower jaws. The metal used in the demonstration was copper. He has four sizes of cutters for cutting out the metal. This is done by means of a press and a punch. The same press is used both for cutting out the metal and punching it. After a piece of metal of the required size has been cut out, it is formed into a cup-shape by another punch with a round end, the matrix or hole through which it is pressed to make this cup-shape being open at the bottom and rounded and wide at the top. Over this hole he places the round piece of metal, and the punch is pushed down by the press, when the cup comes out at the bottom. This instrument is then removed from the press and a die substituted for it, which gives the metal cups the appearance of a grinding surface of a molar or bicuspid, as the case may be. . . . Dr. H. A. Parr exhibited a new separator, which is intended to be universal in its application. Those gentlemen who have used the Perry separators, which have recently been introduced, know what a great benefit they are to us; but the trouble is that; although there are four sizes, they do not fit every case. This new universal separator, which has just been constructed by Dr. Parr, answers the purpose admirably as far as I have tried it. I think it will fit almost every case. Of course it is not free from objection. It does not work quite as well as one of Dr. Perry's, because the middle flange is a little in the way; but I think that for a universal instrument it is about the best I have ever seen. . . . Dr. Crowell had at the clinic a platinum plate designed for continuous gum, which he had perforated with a punch, and the funnel-shaped elongations of the holes were countersunk by another punch, making it something like an eyelet, thereby giving a great deal more strength to the plate; and it is claimed that the body adheres very much tighter to the plate than ordinarily. I have myself made a case for a mouth which I can watch every day, and in which heretofore everything has broken; but since the lady has worn a perforated plate, which has been for over a year, it has not failed. I believe those perforated plates are very much better than plain plates. Dr. Crowell also exhibited a new body gum, which was flown upon a piece of 18-carat gold. The body imitates the natural gum in color nicely; and if this preparation proves to be durable I think it will be very valu-

able to the profession. . . . Dr. Martin Degenhardt exhibited a lower molar having an extremely large pyogenic sac on one of its roots. . . . Dr. E. P. Brown, of Flushing, exhibited some of his new moose-hide polishing points, which have just been brought out, and which I think are excellent for polishing fillings and cleaning teeth. He also exhibited his new porcelain crown, and expected to set one at the clinic, but unfortunately could not get the right color. Messrs. Covert & Hartig exhibited a new gas-engine with a new transmitter. I think this engine is one of the best of its description that I have ever seen. It is, for its size, very powerful. It is well known that gas-engines, by reason of the successive explosions of gas, are never devoid of noise; but this one makes the least noise of any that I have seen. The transmitter in connection with this engine, of which I have spoken some time ago, and which was devised by myself, I have here. The transmitter consists of a large metal cone about six inches in diameter at its base and one and a half inches at its end. This cone is placed horizontally with its upper surface, and imparts the motion to a transmitting wheel placed at the upper surface of the cone in such a manner that, while the cone is revolving, this wheel may be drawn from the small to the large diameter of the cone, thereby obtaining either the original number of revolutions of the motor, four times as many, or any intermediate speed we desire. The transmitting wheel which imparts the motion to the suspension engine is held a little above the smaller end of the cone by a spring, and when in this position it is at rest. A cord is attached to the transmitting wheel at one end, and connected with a treadle placed near the chair with the other end. This treadle is to be manipulated by the foot of the operator. While at rest no motion will be imparted to the suspension engine, but as soon as the treadle is depressed the transmitting wheel is drawn forward upon the revolving cone, and motion commences. The more the treadle is pressed down the more is the transmitting wheel pulled forward to the base of the cone, and consequently the greater will be the speed. But as soon as the foot is removed from the treadle the transmitting wheel is drawn back beyond the revolving cone, and the motion of this wheel as well as the bur in the hand-piece are instantly brought to a dead stop. Another great feature of the transmitter is the device by which the motion of the bur in the hand-piece may be instantly reversed, an action obtained by a pair of miter gear-wheels playing at right angles upon a wheel situated at the base of the cone, which, at the will of the operator, can alternately be made to revolve either way, by connecting the action of the main shaft either to the one or the other miter wheel. This reverse action is obtained instantly by pulling the lever either to

the one or the other side, the lever being connected with a second treadle placed under the operating chair.

Incidents of Office Practice.

Dr. S. G. Perry. As the matter of separators has come up this evening, I am inclined to say a word or two on that subject. It is undoubtedly a difficult matter to make a separator which shall be universal in its application and entirely satisfactory in all cases, and the attempt to make it so apply is pretty sure to result in its being somewhat unfitted for some of them. Appreciating that fact, when I worked out the separators which have been made for me by The S. S. White Dental Manufacturing Company, I decided that it would perhaps be better to have a set of three or four different sizes rather than attempt to apply one or two to all kinds of cases, to some of which they would not be so nicely adapted. The failure of these separators to fit that Dr. Bödecker speaks of is an objection that I have not met with. The ones that they made for me from my patterns I have been able to use without trouble on nearly all of the teeth. One or two gentlemen have said they found the bow of the bicuspid separators not quite large enough. In that case the molar size will almost always answer for the bicuspids. In cases where the bicuspid separator is too large the one intended for the incisors will generally answer. I have to show you to-night two separators which have been worked out in my office within the last year by my associate, Dr. W. A. Woodward, and which are constructed upon an entirely different plan. He attempts to do with screws on the side, and by means of the wedge, what I have done by screws direct. These two separators which I show you are the first ones made by his own hands, and they are somewhat crude, because there was no attempt at fine workmanship. The first one is intended for bicuspids and molars, and in certain instances for the front teeth as well. The second one is designed more particularly for the front teeth, and is intended to be universal for those teeth. Strange to say, they are not unlike the separator which has been exhibited here to-night by Dr. Parr, except that they set much closer, are quite out of the way, and perhaps are applicable to a larger range of cases. I have begged Dr. Woodward during the last year to show his device, but he has delayed, thinking that by using it for some time he might be able to make some changes that would make it more perfect. But I have induced him to allow me to show it this evening.

Dr. Bödecker. I have been using the Perry separators for a little over a month, in a good many cases and wherever they were applicable, with the greatest success that I could desire; but I have not

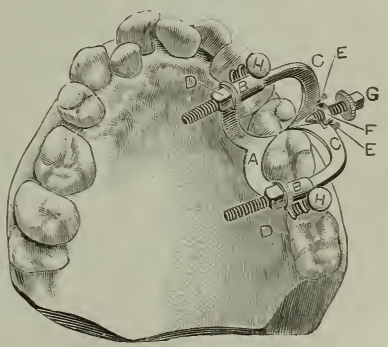
been able to find one of the separators that would fit the lower bicuspids.

Dr. Perry. Did you try the one intended for the front teeth?

Dr. Bödecker. Yes. It is a little too small, and the bicuspid separator is much too large. Wherever appicable they are really the most effective things one can use.

President Carr. Will Dr. Parr exhibit his separator now?

Dr. H. A. Parr. Mr. President and Gentlemen: This separator which I bring before you is entirely new with myself, and intended to be universal in its application. The specimens which I show you are not entirely perfect. The workmanship is quite rough; but the idea is to follow up a principle, which has been laid down by older heads than my own, that is a combination of the wedge and screw, in separating the teeth. I have some models and drawings here to show how the instrument is applied to the teeth. It has been tried only in the mouths of a few dentists. In every case it has separated the teeth very readily, and shown that it will do the required work. The instrument is simple in its construction, being a continuous circular wedge, and by its use teeth can be separated in a few minutes with but comparatively little pain and in most cases none at all. The separator, as I present it to you, possesses the following advantages: First, it is universal in its application, and can be adjusted to the upper or lower teeth, to either incisors, bicuspids, or molars, equally well; second, it is particularly adapted for separating irregular teeth; and, third, it may be advantageously employed in correcting many cases of irregularity. I will now describe its parts in detail. (See illustration.) A represents an angular bar which is tapered to a point and reaches out in a semicircular form, having parallel sockets, B B; C C are two semicircular bars, the inner ends of which are tapered to a point and meet at an acute angle directly opposite the angle of the bar A. The arms of C are long and threaded at the ends, which pass through the sockets, B B, to receive the nuts, D D. These nuts can be moved with the thumb and finger, or a wrench, if required. Upon the convex sides of the bars, C C, are lugs, E, to receive the movable cross-bar, F, which is pierced by a screw, G, having a conical end which rests between the bars, C C, and upon being turned forces apart the bars C C. Under ordinary circumstances the turning of the nuts, D D, will be suffi-



cient to secure a separation, but when more power is required the screw, G, should be used and the desired separation thereby effected H H are screws passing through rings, by means of which the instrument may be so adjusted to teeth of any length as to prevent undue pressure on the gums.

Dr. John J. R. Patrick, of Belleville, Ill., was introduced, and read a paper entitled

The Progressive and Retrogressive Physiological Metamorphosis of the Jaws and Teeth.

Gentlemen: If we look over the past history of the science of anatomy, we will find that it has made marked advance only when connected with the progress of some collateral science. Thus, with regard to the elementary constitution of the earthy salts of the hard portions of our body, our knowledge has been mainly due to the refinement of chemical analysis, and many of the most important principles in physiology have been established by microscopic investigations. By use of the microscope the physiologist has been taught that the earthy particles of bone and dentine are not irregularly thrown together with the animal bases, but that these particles are built up, with the animal bases as a cement, in the form of tubes or hollow columns in predetermined arrangement, in which there is discovered the same relation to the acquisition of strength and power of resistance in the right direction as in the disposition of the columns, beams, and girders in a finished work of architecture.

The development of teeth and bones is identical. The hardening salts in both cases are deposited in preformed cells or cavities, organized in a pre-existing mold or matrix of animal matter. But they differ in the direction of the deposit, which in bone is from the center to the circumference ; in tooth, from the circumference to the center. The process of calcification in bone is centrifugal; in tooth, centripetal. Therefore, a tooth, when fully formed, being exposed to the influence of external agents, is subject to decay or injury, but has no inherent power of reparation, and can only increase in size after its formation is completed by the growth of its most highly-organized constituent, the cementum. The cement always closely corresponds in texture with the osseous tissue of the animal to which the tooth belongs, and this is so true in every instance that it serves as a guide in the determination of the nature and affinities of extinct species of animals; and wherever it occurs of sufficient thickness, as upon the teeth of the horse, sloth, or ruminants, it is also traversed, like bone, by vascular canals. The dentine of the teeth of most mammals, reptiles, and *some* fishes is

unvascular; but the dentine in the teeth of most fishes, some mammals, and a few reptiles is traversed by canals containing blood-vessels, or a projection of the vascular pulp into the dentine, and the tooth-substance thus modified is termed vascular dentine. Now, the vascular and unvascular dentine is often present in the same tooth, as in the teeth of the sloth, the walrus, and the sperm-whale, for the transition from the vascular dentine to true bone is gradual and close. Where a succession of teeth is required, as in mammals and many fishes, the process of formation is by conversion of, instead of transudation from, a pre-existing pulp, and a successive formation of these pulps necessarily follows. No existing species of fishes or reptiles can be said to have permanent teeth, as their teeth are constantly reproduced, and no extinct species of either class has yet been found with teeth having divided roots, or manifesting evidence of perpetual growth by a persistent pulp. In teeth where the pulps are persistent, as in the tusks of the elephant, boar, and walrus, and in the incisors of rodents, the formative process is by transudation from, and not by conversion of, the pre-existing pulp. Hence, we find the teeth of all mammals, both deciduous and permanent, where the pulps are not persistent, when in a healthy condition, and having served the purpose for which they were designed, become solid with age, having no internal cavity; and this is produced by conversion of pre-existing pulp into tooth-substance.

To obtain a certain knowledge of the whole structural relations of the human teeth seems only possible when their development is studied in very differently constructed teeth; for, the higher an animal is placed in the scale of organization, the more distinct and characteristic are the various organs of the body, and the different tissues which enter into their composition; and this law is well exemplified in the teeth. The great variation in tooth-structure is always adapted to the various conditions of the animal. The teeth determine the character of the skeleton and food; the food determines the structure of the alimentary canal, and the alimentary canal with the skeleton determines the exact condition of the tissues with which the skeleton is clothed.

The science of morphology teaches that, however modified the bones of animals may be, they all commence as cartilage, and some never ossify, but remain in a cartilaginous condition; and this cartilaginous condition may be regarded as the primitive condition of all bone-tissue. Bone, which performs the function of organs of support and protection, takes the place of cartilage; the lower gives place to the higher and more complete arrangement. It is in this way that the whole skeleton gradually passes from a cartilaginous into an osseous condition. The osseous elements which go to make

up the first advance towards a bony cranium are almost all derived from the dermal structures, which are met with as dermal denticles in the sharks and rays. Some of these bones appear on the outer surface of the cartilaginous cranium, and form the covering bones of the skull; others are found in the mucous membrane of the mouth, or in those cartilaginous arches which aid in forming the boundaries of this cavity; while the true teeth, with their alveoli, are the product of the mucous membrane of the mouth. In the shark family their structure and development are exactly the same as that of the dermal denticles; the matrix of the two is continuous; and, as in many of the same family (salachii), these integumentary scales are distributed over the wall of the buccal cavity, we may conclude that the teeth and scales were originally identical. The difference between the true teeth and scales is clearly due to the adjustment of the same matter to perform new functions. As the cranium owes its shape chiefly to the extension of the contained parts, and as the brain and cerebellum of the fetus are formed long before the skull, it may readily be inferred that the bones of the skull are impressed by the brain, and assume its form. In like manner the pulps of true teeth determine their figure. Before the ossification commences the pulps acquire the form of the complete teeth, but when the ossification of the body of the teeth has been in part completed the pulp elongates, and upon the elongation the roots of the teeth are formed. When the vestibule of the alimentary canal is divided into the nasal and buccal cavities, by the formation of a palate, a number of organs which were seen in the primitive arrangement are assigned to the buccal cavity, while other organs appear only as later developments. The teeth, tongue, and various glandular organs belong to the former series, but the velum palati is only to be found in the mammals; and the prolongation of the velum, called the uvula, is present only in man and the apes.

When we examine the mechanism of the jaws of animals, we will find that the teeth have been modified in conformity to the direction and manner in which the forces are exerted in mastication; and it is also true that the jaws and the whole skull have been modified by the muscular forces directing these movements. The elevation of the lower upon the stationary upper jaw is a very energetic movement, and is performed by the temporal, masseter, and internal pterygoid muscles. Now, all these muscles are attached to the lower jaw between the fulcrum or condyle of the jaw and the weight to be moved, or fore part of the jaw. They therefore constitute levers of the third kind; and hence, though acting promptly, are placed at comparative disadvatage for exerting their full force. The lateral movements of the lower jaw are effected by the alternate

contraction of the external pterygoids; they are feeble in man, but attain their highest state of development in the ruminants. The forward and backward movements, also feeble in man, but very powerful in the rodents, are due,—the forward to the external pterygoids, the backward to the deep portion of the masseter, the posterior fibers of the temporal, and the internal pterygoids.

The buccinator, which forms a considerable proportion of the thickness of the cheek,—and which is an important agent in preventing the accumulation of food between the teeth and the cheek, the occurrence of which is so troublesome in some cases of paralysis,—becomes a power in the movement of the jaws in some animals. In estimating the muscular power necessary to grind or cut the food in mastication, the kind of food and the form and character of the teeth are important factors. The rapidity with which the carnivora depress and elevate the jaws in seizing a living prey is accomplished by the enormously developed temporal and digastric muscles; and owing to the great development of the temporal muscle the orbits in these animals are not separated from the temporal fossa in the skeleton, and their teeth, being acute wedges, have little resistance to overcome. In the ruminants or herbivorous animals, where the power is used exclusively to grind the food, the masseters and external pterygoids are greatly developed, and in the rodents the temporal muscle is a mere thread, but the masseters, the internal and external pterygoids, are very large. The inferior jaw in the rodents is articulated by a longitudinal condyle, in such a manner as to allow of no horizontal motion, except from back to front, and *vice versâ*, as is requisite for the action of gnawing. In the true carnivora, owing to the rising edges of the glenoid fossa and transverse position of the condyles, all forward, backward, and lateral motion of the jaw is precluded, and the jaws in these animals open and shut like a hinge. The ramus and the condyles being but a little above the line of the back teeth, allow the jaws to fall low enough to clear the points of the cuspids, and thus bring these trenchant teeth into action. In all animals presenting this conformation of jaw the temporal muscle is highly developed, giving great speed, and the loss of power is compensated by the conformation of the teeth; and this law of mechanical force is present in the form and arrangement of the dental series of all animals,—the further the teeth are from the power the more they assume the form of a wedge. The law is beautifully illustrated in the dental series of man, who is endowed with an uninterrupted series, representing in their forms and characters the teeth of all other mammals, and the different movements of the jaw possessed in part only by other animals are all reproduced in a moderate degree in the human subject. In

short, the motion of the jaws corresponds to the character of the teeth implanted in them, and the condyles and muscular arrangements are modified accordingly. The mouth in all animals when at rest is closed, the teeth resting on each other with a gentle pressure; but as rest is simply a gradual change of position, the teeth are alternately in contact and slightly separated. The muscles which close the jaws being much more powerful than those which open them, there would be no equality of muscular force to maintain the lower jaw in a quiet condition were it not that the muscles which open the jaw are attached in such a way to the lower jaw as to form levers of the second kind; whereas the muscles which close the jaw, while more powerful, are attached so as to form levers of the third kind, and thus the opening and closing forces are equally balanced when the jaw is at rest. It seems to be impossible for the muscles which open and close the jaw to contract at the same moment. They therefore cannot be considered in the light of opposing forces, as they act in unison, but in opposite directions, depressing and elevating the jaw alternately. From these considerations it would appear that the teeth of man cannot be thoroughly understood without including the growth and development of the same kind of organs formed for similar functions under different circumstances in other organizations.

In describing the superior and inferior set of human teeth, deciduous and permanent, I will use the terminology employed by the general anatomist when he draws an imaginary line through the body dividing it into two lateral halves. This line he calls the internal surface or margin, right or left; all that is distant from this line right or left is the external margin or surface. All that which is directed in a line from the brow to the great toe is the anterior; and all that which is directed in a line from the back of the head to the heel is the posterior. So, all that is directed from the soles of the feet toward the crown of the head is the superior, and all that is directed from the crown of the head to the soles of the feet is the inferior, surface or margin.*

This terminology will not conflict with the vocabulary now employed in describing the different surfaces and margins of the teeth, as the words mesial, distal, labial, buccal, lingual, and palatal are sufficiently clear for ordinary purposes; but as the teeth can be

* In a recent nomenclature given to the profession no less than fifty-three surfaces are enumerated, and not a single margin. As there are no tangible objects in the whole universe that have surfaces but what also have margins (with the exception of spheroids), I see no reason for omitting margins in a description of the human teeth.

fully described by the terms in general use by anatomists, I prefer to use these terms, since they have the least tendency to confusion.

Now, inasmuch as the teeth are arranged in the maxillaries of the human subject in a parabolic curve, and are uninterrupted by any vacant space, as in most other animals, and as the cuspids are situated on that part where the alveolar curve retreats posteriorly and almost forms an angle, it would not be strictly true to call the margins of these teeth internal and external, and their surfaces anterior and posterior. Therefore, to prevent error, we will name the margins of these teeth the anterior and posterior, and their surfaces the external and internal, and thus include their surfaces and margins with the bicuspids and molars. On the contrary, the general rule will be observed in describing the incisors; their margins are internal and external, and their surfaces are anterior and posterior, and this rule will apply to the inferior as well as the superior set. In relation to their situation, the teeth are classified into superior and inferior teeth; in relation to their duration, into deciduous and permanent teeth; and in regard to their kind and form, into cutting or incisors, cuspids, bicuspids, and molars. Those twenty teeth found in the maxillaries of a child between the ages of three and six years are called deciduous. Previous to three years they are not all present, and later than six years they begin to drop out, by a physiological process of exuviation, and to be replaced by new permanent teeth. The expression "teeth of the first set," meaning the deciduous teeth, is likely to lead to error, for the reason that the six upper and six lower permanent molars are teeth of the first set, which are never replaced by others. In a human being of twenty-five years of age the permanent set of teeth, thirty-two in number, is generally complete. Twenty are permanent succedaneous teeth, and take the place of the deciduous teeth that are lost; the other twelve molars which are to the posterior have had no predecessors, and never mutate. According to species and form in the superior and inferior maxillaries, the four anterior teeth are cutting or incisor teeth; the next two pointed teeth are cuspid; the next four are premolars, which are bicuspid; and the last three on each side of each jaw are grinders or molars. These four species of teeth are generally recognized by naturalists and anatomists as belonging to man as well as most other mammals. Now, it is well enough to observe that the eight bicuspid teeth which belong to the permanent set in man are not preceded by teeth of the same character or form, nor do they occupy as much space in any direction in the form of their crowns as their predecessors; they therefore deserve to be classed as a definite and separate species from the true molars, and they are accordingly so classified. Furthermore, the deciduous molars which

precede the bicuspids occupy a different position in their relation to the power that moves the lower jaw upon the upper. Had they been succeeded by teeth with large, square crowns, with broad masticatory surfaces, they would have been comparatively useless after the development of the permanent molars and consequent progressive growth of the jaws from the posterior forwards. From the time of the appearance of the permanent molars the deciduous molars are gradually moved forward, increasing the distance from the attachment of the masseter muscle, until finally, becoming comparatively useless for trituration, other teeth, better adapted in form and position to the power that moves the lower upon the stationary upper jaw, take their place. The usefulness of the deciduous molars for grinding purposes decreases soon after the sixth-year molars make their appearance, and from three to four years later the bicuspids take their place, having mostly single roots and smaller crowns. This arrangement as to the change of form in the succeeding bicuspids, which occurs in man and the apes, does not take place in animals that have long jaws, as their permanent premolars are exact duplicates of their deciduous ones. This is owing to the different arrangement in the attachment of the muscles that move the jaw. The arrangement and development of the deciduous teeth in man are further examples of the same law,—the cuspid cuts the gum a few months later than the first molar, but a little before the second molar; whereas, in the second set, both bicuspids appear before the cuspid; the deciduous cuspid being carried over to the eleventh or twelfth year, the last remaining tooth of the deciduous set; and there is no necessity for its earlier displacement, notwithstanding it is gradually removed from the power that moves the jaw. Being wedge-shaped, it would always be of service in the anterior portion of the jaw. In point of lever-power in the undeveloped jaw of man, the deciduous cuspid represents the first bicuspid, the first deciduous molar the second bicuspid, and the second deciduous molar the sixth-year or first molar of the second set. And thus we have presented in the human mouth remarkable instances of how the forces in nature modify and mold the forms of plastic material to suit the circumstances that surround them.

As it is only in a child of four or five years of age that the teeth are perfectly formed, and as we find that before the fourth year the root ends are not quite formed, and that after five years they commence to be exuviated, we will take for our subject a set of teeth as found in a child's mouth between four and five years of age, and endeavor to describe them. The twenty deciduous teeth of a child of the above age are of a blue-white color; their parenchyma is much softer, and most of them are much smaller than their

successors. The superior incisors of a child resemble all four teeth of a permanent set on a smaller scale, but present a more scalpriform appearance. They are situated, like their successors, in the anterior portion of the jaws. On their posterior surfaces they never have protuberances and blind indentures, and the sharp margins of their crowns are never serrated, which is usually the case in their successors of the second set during the first year of their appearance. Their round roots are frequently curved. The curvatures, however, are not directed as the curvatures are in the second set, from the anterior to the posterior, but toward each other; that is, the point of the root of the right is nearly always directed towards that of the left tooth, and the root of the left tooth to that of the right. The deciduous cuspid is shaped like its successor,—much smaller, its crown more tapering, and its root rounder and more peg-shaped, and when curved the curvature is from posterior to anterior, and toward the upper lip. All that can be said of one side of the dental series is equally true of its opposite in the superior and inferior maxillaries. We will therefore speak of but one side of each series. The deciduous molars supply in children the place of the permanent molars in the adult, and nature has accordingly, on a smaller scale, formed them similar to the latter, with this difference, —the first permanent molars of the superior and inferior maxillaries are always the largest, while, on the contrary, the first deciduous molars are constantly the smallest; and in so far as the successors of the deciduous molars are concerned, especially the upper, they are nearly alike in size, but always smaller than the deciduous teeth that preceded them.

Special Description of Superior Deciduous Molars.—On each side of the superior maxillary there are two of these teeth. During the age of childhood they complete the dental curve. The first is much smaller than the second. Its two broad cusps, which are provided with sharp margins, are separated by a deep furrow, which has an anterior and posterior direction; the external protuberance is much larger and broader than the internal, and where its external side joins its anterior half at the dental neck or cervical border it presents a rugged elevation. Furthermore, its crown, in a somewhat larger form, is similar to the first bicuspid that succeeds it. The three roots, however, which this tooth possesses have, with the exception that they are smaller and weaker, the same position, direction, and form as the roots of the superior permanent molars. Very often the posterior external root of this tooth is fused with the internal roundish root, ofrming a broad, shallow osseous lamella. The second superior deciduous molar resembles the first superior permanent molar on a smaller scale. It has, like that tooth, a crown

presenting the form of a rhomboid, one of the acute angles directed to the anterior and outside, and the other to the posterior and inside, with four ridges, with three roots formed like those of the permanent set, but much weaker and softer. It can be distinguished from the first deciduous molar by its greater size, by its contorted square crown, and the four cusps which are present; also from its mate on the opposite side. The right and left deciduous molars can be distinguished one from the other by the marks that I have mentioned. If the posterior external root of the first superior deciduous molar is fused with the internal round root, the circumstance must not be forgotten that it is always the posterior external, therefore the smaller, root which becomes united with the internal round root, and that the free root is always the anterior and larger one; then all doubts will be removed. When the two external roots are free and not conjoined, and are nearly of equal size, then the projecting elevation of the first superior as well as the inferior deciduous molars is to be taken into consideration, which will be sufficient to distinguish the right from the left; for, if the right were held to the left or the left held to the right side, the projection, which is always situated on the anterior half of the external side of the crown near the neck of the tooth, and consequently near the cuspid, would be either toward the anterior internal or posterior external, which is never the case.

Deciduous Teeth of the Inferior Maxillary.—All that has been said of the upper incisors applies also to the lower; only the lower are much shorter, smaller, and, like the larger upper teeth, they are not serrated on the sharp margins of their crowns. Their roots are not compressed laterally, as in their representatives of the second set, but are rounded. The deciduous cuspids have the same form and position as the permanent cuspids,—much smaller, crowns more club-like, and tapering abruptly to a point, with round-formed roots. The inferior deciduous molars, two of which are on either side of the jaw, are the last and most posterior teeth of a child. The first and most anterior of these teeth joins the cuspid on each side of the jaw, and is different both in size and form from the second. Both the deciduous molars on either side have an anterior to posterior directed elongated crown. The first one is much smaller and narrower, and on its grinding surface are two indentures,—the anterior indenture being the smallest, the posterior the largest. These indentures are separated from each other by an elevation, the external and internal ends of which form a cusp. Of the four side surfaces of the crown of this tooth, which are all more or less arched, the anterior and posterior are very narrow, the internal somewhat wider, the external the widest, and on its external surface can be seen, at

the most inferior part of its anterior half at the cervical margin, a rounded, large, projecting protuberance, which is similar to that on the superior corresponding tooth. This protuberance on the external wall of the crown gives these teeth the appearance of a more inwardly inclined direction than they possess. This tooth is provided with two roots, which, on a small scale, are disposed like those of the permanent inferior molars; only the external margin of the roots of these teeth is broader, and serves, in connection with the broader and more arched external surface of the crown, as a mark of distinction between the right and the left.

The second inferior deciduous molar, on a smaller scale, has entirely the form of the first inferior permanent molar, and, with the one on the opposite side, is the only one which on the superior surface of its crown has five cusps, three of which are situated externally and two internally. Of the three external cusps the anterior is the largest, and the posterior the smallest. The two internal ones are of equal size. Now, the base of the first and second external cusps, where they join the cervical margin, is strongly arched, and, as in the first molars, the external surface of the crown at this point appears to be more inwardly inclined than it really is. This tooth has also two roots resembling those of the permanent first molar; they are somewhat softer, narrower, and shorter, and their broad ends are either divided into two small points or terminate in a diagonal or horizontal line. Since the roots of the permanent molars have rounded points, the deciduous molars are easily distinguished from the permanent ones.

In making a special division of a human tooth we find three parts to be considered,—the crown (corona), the neck (collum), and the root (radix). The crown is the strongest and thickest portion of the tooth; is more or less completely covered with enamel, and projects into the oral cavity. The neck is the shortest part of a tooth; is situated between the root and the crown; is not enamelled, and is more noticeable on teeth that have several roots than upon those that have but one. In the healthy state it is covered by the gums until advanced age, and where it joins the crown the enamel ends around its whole circumference in a gradual thin margin. Each tooth has either one or more roots. They are the thinnest and longest of the tapering portion of the tooth, and when in place are invested their whole length by the cells of the maxillary bones. The neck and the whole external surface of the root or roots of each tooth is invested with a peculiar cuticle or membrane, which should not be confounded with the periosteum of other bones. The texture of this membrane is quite different from fibrous membrane. It is a peculiar membrane of a compound char-

acter, adhering by one surface only to the roots of the teeth, and not connected to the cell-wall by its own substance, but receiving its nutrient vessels through the numerous foramina of the cell-walls. Furthermore, the cell-walls are neither lined with a periosteum nor any other well-defined membrane. There is, however, a very delicate pellicle of membrane of a serous character lining the cell, continuous with and covering the cell-surfaces of the cancellated bone of the alveoli. Teeth, like all organized bodies that are thrown off from a parent stock, are provided with a placenta or investing membrane of connective-tissue. In the course of time, or after it has served its purpose, a retrogressive physiological metamorphosis commences, by which the deciduous teeth are exuviated, together with the alveoli that surround them, giving place to a physiological, progressive metamorphosis, which brings up the permanent set with new alveoli and increased size of the maxillaries. The pathological phenomena which have been so long observed on the membrane of the dental root in the frequent inflammations which affect these parts show conclusively that teeth are peculiar bodies, and have no affinity with other bones; for we find by long experience that coalescence never takes place between the roots of teeth and the cell-walls, which are in close contact, for the reason that dental roots and their cell-walls are heterogeneous; yet the roots of two adjoining teeth will coalesce when brought in contact by previous inflammatory destruction of dental septa, because the roots of teeth and their investing membranes are homogeneous. All experience teaches that only those bones become united whose uniting surfaces are of the same texture in consequence of a pathological process. Thus, two bones that are covered with bone-membrane will unite by adhesive inflammation, or two bones that are covered with cartilage, by exuding a unifying substance, become united, as in anchylosis. How fortunate it is that the teeth are so constructed that their roots cannot coalesce with the bone-walls that surround them. Were it otherwise, the frequent inflammatory conditions to which the several members of the oral cavity are subject during a lifetime would render the removal of teeth, in case of necessity, exceedingly dangerous.

Special Description of the Permanent Teeth.—In the description of a permanent set of teeth I will take the skull of a twenty-five-year-old subject, in which the teeth are perfectly developed, healthy, and very little abraded. If, however, we would wish to see the three small cusps on the large and small incisors, and occasionally on the cuspids, their crowns must be examined during the first months of their appearance; for later these cusps are worn off, being soft, and after a year they are entirely gone. These small cusps are never

present on the deciduous teeth. Since there is a great difference between the teeth of the superior maxillary and those of the inferior, I will endeavor to describe each tooth separately.

The superior middle incisors are situated near each other in the anterior and middle of the alveolar curve. Each has a wedge-shaped form; the posterio-anteriorly directed crown is distinguished by an anterior and posterior surface; an internal, an external, and an inferior margin. The anterior surface is somewhat smooth, and in length and width is slightly arched; the posterior surface is narrower, somewhat concave, and frequently uneven. Both surfaces are widest at the inferior margin, and become gradually narrower toward the neck of the tooth. Of the two lateral margins, the internal is the longer and the external shorter and slightly arched; they unite with the inferior sharp margin at two right angles, of which the external is always rounded. By this rounding, which is always toward the lateral incisors, the right incisor may be distinguished from the left. Where the two lateral margins meet and unite with the inferior sharp margin they are narrowest, but they gradually become wider to the superior, and where they are lost in the neck of the tooth they are broadest. Therefore, the inferior part of the crowns of all the superior incisors are broader and thinner at the inferior, but toward the superior, near the dental neck, they are narrower and thicker. Thus the wedge-shaped form of these organs is described. The root of the large middle incisor is always single rounded, but somewhat angular, presenting its broadest surface to the anterior, its obtuse angle to the posterior, with its point or apex terminating bluntly. If the roots of large middle incisors should be curved,—which is seldom the case,—the bend is always directed to the lateral incisor. When the points of the roots of permanent teeth are bent, no matter to what species they belong, either in the inferior or superior maxillary, the curvature is always directed toward the adjacent posterior neighbor; consequently, from the internal to the external in case of the incisors, and from the anterior to the posterior in the rest of the teeth. On each side, between the front or middle incisors and the cuspids, there is one lateral incisor. They are similar to the front incisors, but smaller. Their crowns are also directed from superior to inferior outward; they are a little shorter, and on their anterior surface more arched; the external angle, which is near the cuspid, is more rounded than that of the central incisors, and their roots are also single, somewhat rounded, slightly depressed laterally on both sides, and dull-pointed. In some cases the roots of the lateral incisors are longer than those of the middle incisors, and the relative length of the crowns to the roots of all the superior incisors is as 1 to 1½ or 2. The superior cuspid

is placed between the lateral incisor and the first bicuspid. It has a slightly external direction from the superior to the inferior; a strong, thick, club-shaped, angular crown, which generally increases in width and thickness from the neck to its middle, where it again decreases inferiorly until it ends in an obtuse angular point. It has two surfaces and two margins. The external surface is strongly arched in its length and width on the side toward the lateral incisor; the internal surface is slightly uneven, and is obliquely directed from above downward and outward. On the internal surface are two small depressions, which are separated from each other by an oblong ridge in a superio-inferior course. On the two puffy, bow-shaped, lateral margins of the crown the posterior has a larger and more bulging curve. This and the stronger arch on the anterior half of the external surface serve as a mark of distinction between the right and the left cuspids. The root of this tooth is simple, very strong, and generally straight; but sometimes the point is bent, always to the posterior; its lateral sides are more or less compressed; wherefore result two surfaces and two margins,—the external margin much thicker than the internal. The relative proportion of the crown to the root of this tooth is as 1 to 2 or 2¼. The cuspid must always insert itself between two teeth that have previously taken their place in the dental series; the second bicuspid also has to find its way between the first bicuspid and the first molar, but, owing to its form, presenting flat surfaces towards its neighbors, it is not as likely to be displaced as the cuspid, and the alveolus being wider in its region, it has fewer difficulties to surmount. The displacement of the cuspid or other teeth never takes place in other animals. This is owing to the inter-dental space, which is always present in the dental series of other animals.

Between the cuspids and the molars there are two premolars on either side, which in man and the apes are bicuspid. Along their whole length they are anterio-posteriorly compressed. On the crowns of these teeth there is one external and internal much curved, an anterior and posterior lightly curved, and an inferior, hollowed, uneven surface, which is separated into two ridges by a depression that has an anterio-posterior course, of which the external ridge appears larger and thicker than the internal, the latter being less extensive and lower. Extended from the depression of the inferior surface there are two small fissures or rimosities toward the large ridge, and also two toward the smaller. The posterior surface of the crowns of these teeth is shorter and more arched than the anterior, which gives to the crown an inclined appearance posteriorly. This, in connection with the external larger ridges or cusps, is the mark which distinguishes the bicuspid teeth of one side

from the other. The crown of the first superior bicuspid is a little smaller than that of the second. Each of these teeth has usually a simple straight root, compressed from the anterior to the posterior, which frequently is divided into two points at the extremity. When two roots are present, each has a round form, and the larger one is situated at the exterior, and the smaller and shorter one to the interior. When, however, two roots are present, it is generally the first bicuspid that possesses them. When the roots of these teeth are not separated they present the appearance of having two roots connate, and in a majority of instances they have two root-canals. The relative proportion of the crowns to the roots of these teeth is as 1 to $2\frac{1}{4}$ or $2\frac{1}{2}$. According to these relative lengths, one might infer that the bicuspids were longer than the cuspids. This, however, is not the case, for what they gain in the length of their roots they lose in the length of their crowns. So also are the crowns of the superior and inferior incisors, as well as the cuspids, normally one-half higher than the bicuspids and molars; but the teeth of the latter species, notwithstanding the greater proportionate length of their roots, still do not exceed the total length of the former. The superior molars have the strongest and largest crowns; they are placed in a vertical direction from above downward, and possess the greatest number of roots. On each side of the dental curve there are three; the first one is the largest, and since the second one is in form quite similar, though smaller, a description of the first will answer for the second. The third molar, or wisdom-tooth, which is generally the smallest, we will consider separately, as it is altogether different from the others. The first superior molar is the largest; has, like its adjacent neighbor, a crown resembling a rhomboid, and this rhomboid form is prominent in all the superior molars, so that they appear contorted; the crown of the second is more contorted than the first. In all such contorted crowns one of the acute angles is directed to the anterior and outside, and the other to the posterior and inside. On this contorted crown there is an external and internal, somewhat arched; an anterior and posterior, less arched, and an inferior, hollowed, uneven surface, which is the grinding surface, and upon this surface are four protuberances formed by two intersecting furrows. The two external protuberances are generally the largest; the internal the smallest. These teeth have three roots when in a normal condition, but it frequently happens that they are in partial or whole union with each other. Two of these roots are toward the exterior, and one of them to the interior. Of the external roots, one is situated anteriorly and the other posteriorly. Both are compressed from the anterior to the posterior, and each has an anterior and posterior surface and an internal and ex-

ternal margin. They diverge from a broad base out of the neck of the tooth, and gradually decrease until they end in a flattened point. The anterior one is always broader and longer than the posterior. The internal root is nearly round; arises from the middle of the tooth's neck with a strong basis, and becomes gradually smaller in its course until it ends, after describing a bow-shaped curve, with a dull, rounded point. The roots of these teeth as to length are quite variable, especially in the wisdom-teeth. The marks of distinction between the first and second molars consist in the larger size of the roots and crowns of the first, the roots of the first being more divergent than the second.

Superior Wisdom Teeth.—On each side of the arch there is one which completes the superior set of teeth. In form and size it is quite dissimilar to the other molars. Its crown is the smallest, and frequently it has only three cusps, two of which are external and one internal. Of the two external cusps, the anterior is always the largest. Its roots are generally three-fold, sometimes four and five, and the alveoli being lowest where this tooth is located, its roots are generally small, stunted, and contorted in development, and more frequently blended together.

Inferior Teeth.—The teeth of the inferior maxillary are generally smaller, and in form somewhat different from the teeth of the superior maxillary, which meet them in opposition when the mouth is closed. The four small incisors are the smallest teeth in the oral cavity. Their position is vertical, and the surfaces and margins of their crowns are transverse to their roots. The two central ones have narrower crowns and shorter roots than the lateral ones. The two middle small incisors are situated in the extreme anterior part of the inferior alveolar curve. They possess an elongated, small crown which is wider above than at its cervical border. They have an anterior surface slightly arched; a posterior surface slightly excavated from above downwards; a superior margin which is sharp, and two lateral margins bluntly arched and thicker below than above, where they join the superior sharp margin on both sides at right angles. The roots of these teeth are single, and are flattened laterally, presenting two lateral compressed surfaces from above downward to the extreme point of the root. In the middle of these surfaces there is a depression or groove which continues to the extreme point. At the bottom of the groove the osseous wall is very thin, which separates the two surfaces, especially towards the point of the root, where it is transparent. It has two rounded or puffy margins, the anterior slightly larger than the posterior. Since the crowns of the middle small incisors are alike, the distinction of the right from the left can only be found in their roots, which generally

have a slight curve to the external. When this curve does not exist, which is seldom the case, then the distinction becomes almost impossible. The two lateral small incisors resemble the middle ones, only they are larger and stronger in all their proportions. Their crowns are more arched on their exterior margins, which gives them the appearance of being broader. The external angle towards the cuspid is always rounded. Their roots are longer and broader than those of the middle small incisors; and, in respect to size and length of root, can be compared to the large middle incisors of the superior maxillary; but in the reverse order, for in the incisors of the superior maxillary the middle ones are the larger, and have longer and stronger roots than those beside them, while in the incisors of the inferior maxillary the middle ones are the smallest, and those beside them are the largest. The inferior lateral incisors are easily distinguished one from the other by their rounded external corners and the outward curvature of their roots. On each side between the lateral incisors and the first bicuspid there is one cuspid, which has a long, dull-pointed, inwardly and backwardly inclined crown, the external surface of which is arched in all directions. The internal surface is slightly excavated from above downward; it is obliquely cut, leaving two longitudinal depressions. The posterior and anterior thick margins on both sides of the superior part of the crown form a blunt angle, inclining toward each other until they unite in a rounded summit. The posterior is somewhat shorter than the anterior. The external surface near the lateral incisor is more arched than that toward the bicuspid, where it is turned inward, and appears a little larger; and all these marks serve to distinguish the right from the left cuspid. The root of this tooth is thick, long, and somewhat compressed from the anterior to the posterior, and is strongly tapering. It has an anterior surface toward the incisor, and a posterior surface toward the bicuspid; an external thick and an internal thinner margin. The marks of distinction by which the inferior cuspids may be known from the superior are as follows: The crown of the inferior in its whole outward construction is weaker, less chubby, but longer, and in its thickness more regular than the superior tooth. Its root is more flattened, furrowed in its whole length, and shorter. The first inferior bicuspid has a short, round, and especially from the outside strongly arched crown, which is inclined toward the second bicuspid. On its superior portion are two protuberances,—the external one stronger, higher, somewhat pointed, and directed towards the tongue; while the internal is smaller, very low, less arched, very dull, and straight. Between the two cusps are two small depressions, which are separated from each other by a small ridge, which joins the two cusps

from outward to inward. This ridge is generally lower in its middle, and sometimes it is incised. If the latter is the case, the two depressions are connected with each other. The single rounded roots among the permanent teeth are found only with the superior incisors and inferior bicuspids.

The second bicuspid is similar to the first, only it has a more globular, thicker, and lower crown; of the two cusps, the external is but little higher, yet longer, than the internal. In some cases the internal cusp is found larger, and then it is depressed in its middle, giving it the appearance of two internal cusps. The two depressions between the external and internal cusps are united by a depression which runs from the anterior to the posterior. This is formed in such a manner that the depression is circular, the outer curve directed toward the internal cusp. The root of this tooth is simple, and in length and size similar to the root of the first bicuspid. In regard to the marks of distinction between the first and second bicuspids, they are so very evident that a mistake could only occur if their crowns were quite abraded by long use. Again, the crowns of these teeth are inclined backward, and are less high on their posterior part than on their anterior. These marks will serve, in connection with the stronger inward-arched external cusps, to distinguish between those of the right and the left side. Finally, the inferior bicuspids form a more gradual transition from the cuspids to the molars than their representatives of the superior set. The crown of the first inferior molar resembles an elongated right angle. It has an external, internal, anterior, posterior, and a superior surface. Being in possession of five surfaces, it follows necessarily that it has eight margins—four lateral and four superior. Of the four side surfaces which vanish inferiorly toward the neck of the tooth, the external is the most arched; the superior or masticatory surface is uneven, and is divided into five protuberances, two internal and three external, by furrows or depressions which partly intersect each other, and have an antero-posterial and an exterior to an interior direction. Of these five cusps the anterior external is in a majority of instances the largest; the second is less, and the posterior one is the smallest; the two internal cusps are strong and of equal size. This tooth has seldom more than two roots. They are very strong and compressed, flat, with their surfaces to the anterior and posterior, and their margins to the interior and exterior. The anterior one of these roots is stronger, broader, and longer, and is provided with a deeper longitudinal furrow than the posterior root. Their points are invariably curved more or less to the posterior; especially is it so with the anterior large root. Although the crown of the first molar has five cusps, which particularly distinguish it

from the others, there are occasionally but four present. In such a case the crown would have no elongated but a square form of regular dimensions, with four equally large surfaces; while in those that have five cusps the external surface is always large. The second inferior molar is smaller than the first, and its regular square crown has always only four cusps—two internal and two external. With this exception, it is like the first molar of the same series. The third inferior molar usually resembles the second molar, though in some individuals it is found to be of an entirely different form; for while it usually has a regular square crown with four cusps, it is frequently seen with an elongated crown with five cusps.

Among all the teeth of the human subject, the wisdom-teeth are the only ones that have no well-defined form, and this is especially the case with the superior wisdom-teeth, for they are almost different in every mouth. Sometimes they are so small that they are scarcely the size of a pea, while the inferior ones even in the same mouth are of such great size and so deformed that they would not be taken for human teeth were they not found in the human mouth. The relative length of the crowns to that of the roots in all molars of a regular set of teeth is as 1 to $2\frac{1}{4}$ or $2\frac{1}{2}$. The wisdom-teeth, however, constantly present exceptions to this rule, as in all others, by possessing, in many cases, very long or very short roots in proportion to their crowns. In the regular dental series of civilized races of men the inferior cuspids are directed inward and backward, and the incisors vertically; the superior incisors forward, and the cuspids outward. The two series are placed on a curve in such manner that when occlusion takes place they are partly over, partly under, and partly on each other. The rhomboid form of the superior molars is produced by the convergence of the maxillary arch, for in animals in which the arch diverges at its tuberosities the teeth are not rhomboid in form. The molars of the inferior maxillaries have the form of an elongated right angle, and we find that the arch is divergent in the region of the molars of this series. The superior molars have three shorter roots, which give them equal power of resistance with the inferior molars' two longer roots. The bones which give support to the process of the superior maxillary are mere shells, arranged in the form of chambers, and the three roots of the superior molars diverge in the broad alveoli. On the contrary, the two longer roots of the inferior molars are slightly curved to the posterior, and compact, and the alveoli spring from a narrow but solid bone base. The roots of the inferior lateral incisors are longer than the centrals, for the reason that they have the mental eminences for a base. The roots of the superior front incisors are longer than the lateral, and we find the nasal spine giving depth for

their support. So, also, is the root of the superior cuspid longer than the inferior, and it finds room in the region of the alæ of the nose in front of the anterior wall of the antrum, the deepest and strongest portion of the alveolar process. During the age of childhood, from one to twelve years, the first and nearly the second set are completed,—that is, so far as the outward forms of the second set are concerned. During the first three years of this period the teeth of the first set are formed with their alveoli. One year later, and a retrogressive metamorphosis sets in. Three years more, and the first of the permanent set appears. Gradually the deciduous teeth with their alveoli are exuviated, whence appear larger teeth accompanied by a larger process, and the jaws become correspondingly larger. At the close of twelve years all the deciduous teeth with their alveoli are swept away. The period of youth continues to the age of twenty-four or five, at which time the roots and crowns of the permanent teeth are completed. From twenty-four to forty-eight, the age of manhood, the internal surface of the teeth decreases, by conversion of the formative pulp into dentine; continuing to decrease through the middle age of sixty and the advanced age of seventy, they approach the condition of solidity in the silver age of eighty-four. Beyond this period lie old age and dotage, when, if the teeth are retained, they have no internal cavity. During all these later years the process of ossification continues,—every tissue of the body becomes more condensed, the bones become firmer, the cartilages harder, and the articulations closer. All the bones of the face become thin and brittle; the foramina, which formerly gave free passage to the nutrient vessels, close. The vessels themselves become blocked up with calcareous matter, phosphates and carbonates of lime, and magnesia. Man commences in a gelatinous and terminates in an osseous condition. Lastly, his nerve-centers lose their activities, and he ends in mere oblivion, "sans teeth, sans eyes, sans taste, sans everything."*

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* Literature.—The following are the works consulted in the composition of this essay: "Comparative Anatomy of the Teeth," by Richard Owen, F.R.S.; London, 1840–45. "Animal Kingdom," by Baron Georges Cuvier; with Additions by W. B. Carpenter, M.D., F.R.S., and J. O. Westwood, F.L.S.; London, 1863. "Comparative Anatomy," by Carl Gegenbaur; London, 1878. "Morphology of the Skull," by W. K. Parker, F.R.S., and G. T. Bettany, M.A., B.S.C.; London, 1877. "The Cat," by St. George Mivart, Ph.D., F.R.S.; New York, 1881. "Anatomy of the Mouth," by Dr. George Carabelli; Vienna, 1844. "An Anatomical Description of the Permanent Teeth," by Homer Judd, M.D., D.D.S.; St. Louis, 1876.

Discussion.

Dr. Carl Heitzmann. Is it necessary to cover such a wide field and go over the whole animal kingdom to take a view of the question of biology? The doctor has spoken a great deal of animals, of groups and families of mammalia especially, but he omitted one group which is most interesting to the dentist, because it has no teeth at all, the edentata. These are creatures which, owing to the food they eat, have no use for teeth and have none. But please let me ask, What is the necessity for teeth with us? Do we need to chew anything very hard? May we not live upon soft food? Look at our ladies, who live all their life-time on caramels, and candies, and ice-creams, eating scarcely anything else. What will be the outcome of a generation of ice-cream eaters? Will they not degenerate by and by, gradually losing their teeth, until, after perhaps three or four generations, they will become entirely destitute of teeth, like the edentata?

The ground covered by our Western friend is a very interesting one, but there are probably not many here who are ignorant of the fact which the doctor has brought before us, that a tooth is divided into crown, root, and neck. It is interesting, of course, to know such things, but to me it is more interesting to study the tissues under the microscope and observe something new that will add to our knowledge of the organization and development of the body.

The doctor has really gone over a very interesting field, and I feel thankful to him; but if he will allow me to make one suggestion, it would be that he add his mite in the line of research, to the increase of our knowledge, by bringing out new facts, and let speculation take the back ground.

Dr. W. H. Atkinson. I think Professor Heitzmann has overlooked a new thing that has been presented to us to-night in the morphology of the teeth, in the idea that the deciduous teeth are not formed by separate points of calcification, as I understood the essayist to teach, but come in as single bodies, without serrated edges, and having no remnant of a denticle when they come through the gum. If that be the case, Illinois children are not made exactly as ours are. All the teeth that I have ever known to be organized at all were produced by points of calcification corresponding to the number of cusps or denticles in the teeth when complete, and which, if they had not been in the neighborhood of others like them, would have come out simply as little conical teeth of the first form. The doctor's theory is new to me, and if he will substantiate it I will give him a Delmonico dinner. I was disappointed in not having the metamorphosis of these structures described somewhat more

elaborately. I think it would be well in preparing such a paper not to select the older representative men from whom to gather facts. He said that the teeth determine the organization or character of the bones; that a certain class of bones and a certain class of teeth go together. They are not so determined at all. That statement is misleading. That coincidence simply reveals what the law is, and not the wherefore of that particular development of the parts or organs we are dealing with. The essayist asserts that simple teeth belong to a simple organization. But we say our human body is the highest type of organization known among animals, and yet our teeth are not the highest or most complicated type of teeth. They are not nearly as complicated as the teeth of the ruminantia, and especially the elephantia. Therefore that assertion does not hold good. Our Western men cry facts, more facts, rather than how shall we correlate the facts we have. I hate facts, when they are not correlated so that we may understand their meaning. Superficial observers and readers of the works of Charles Darwin have forced into his mouth interpretations of his writings that I think are not warranted at all. I do not understand him to have said that man was developed from the simia, but he did suggestively lay out hypothetical possibilities out of which that which is now known as evolution has its latest origin.

Dr. Patrick. I think that anatomy and physiolgy and all the subjects that I have treated of make up just as big a field in the State of Illinois as they do in the State of New York. I do not think that the *os cocci* or the *os pubis* is any different in Illinois than in New York, and I will say to my Hungarian friend that he is wrong when he says that the edentata have no teeth, although the name implies that. They have no front teeth, but they have back teeth. Their teeth are very different from those of other animals. They are very unlike the teeth of animals that have incisors. Therefore, if you give me one of those teeth, I care not where you get it, I will tell you in a moment what animal it belongs to. There is some truth in teeth if they are properly understood. But you never can understand them until you understand their surfaces and margins, their roots and crowns. And you never can know how to put on an artificial crown properly until you understand the particular form of every tooth. No man can fill the root of a tooth without he understands the internal surfaces of the teeth, as well as the external. He is a mere artisan, and not entitled to the name of professional man. I regret very much that my paper was necessarily long. I went into a description of teeth simply because, as I said, no good description had been attempted to be given of them. All descriptions have fallen very short of what is required.

Adjourned.

The society held its annual meeting Tuesday evening, April 6, 1886, in the rooms of The S. S. White Dental Manufacturing Company.

The president, Dr. William Carr, in the chair.

Dr. W. H. Atkinson, of the Clinic Committee, reported as follows:

Mr. President and Gentlemen: The attendance at the clinic to-day numbered about ninety. Dr. G. H. Dickey, of Brooklyn, presented a young lady, nine years of age, with a malformed tooth. . . Dr. C. H. Mosely, of Brooklyn, exhibited the use of his anesthetic. It requires from seven to twenty-two inhalations to produce anesthesia, which lasts from thirty to sixty seconds. It was given to a patient for whom three teeth were extracted, and was also given to several others for experiment. Dr. Mosely had used the anesthetic over five years, and administered it to more than three thousand patients. . . . Dr. Hamlin Barnes demonstrated the lining of rubber plates with heavy gold. . . . Dr. Frank P. Abbott, of Brooklyn, presented a patient for whom he had inserted a very large filling, involving the mesial and grinding surfaces of a right first molar, made in twenty-three minutes with the new gold introduced some months ago by Dr. Brauneis. . . . Dr. Crowell, of New York, showed some pieces of 18-carat gold and of platinum upon which some of his new body and gum-enamel had been flown. Both require only a dull red heat for fusion, and are claimed to be stronger than the ordinary continuous-gum material. . . . Dr. Starr, of The S. S. White Dental Manufacturing Company, exhibited a new sliding box for instruments, and a box containing three glass jars for holding polishing materials. . . . Dr. Verplanck, of Albany, showed a new rubber-dam holder. . . . Mr. Fried Feltner showed some new carbolized preparations manufactured by S. Brechtel & Co., of Nurenberg, Germany, which are especially recommended by A. Witzel for the treatment of exposed pulps. These preparations are extensively used in Germany. . . . Dr. W. H. Mitchell presented a pair of models of irregularity, and some new small impression cups for crown work. . . . Dr. E. P. Brown, of Flushing, showed a new lot of his depressed rubber dam, which was exceedingly tough. . . . Dr. C. F. W. Bödecker exhibited a collection of teeth and matrices sent to the clinic by Dr. William Herbst. The teeth were to illustrate the use of gold together with amalgam. Dr. Herbst will give a clinic in July, lasting three or four days, if the society desires. . . . Dr. Morey exhibited a case of fusion of two germs in the site of the right superior central incisor in a lad of seven or eight years of age. It is a very peculiar case. That portion towards the mesial wall shows a tooth about one-third the size of a normal central, which is fused to another one of nearly the full breadth, the whole

making a very large, broad tooth, considerably recurved on the palatal wall. The arch is swollen above, indicative of the coming of some undeveloped tooth. The first molars are well through, are pitted somewhat, and have imperfect sulci. The upper malformed tooth shuts on the inside of the inferior incisors. I advised the guarding of the first molars by filling, bringing the other one out, and waiting for further developments.

This being the annual meeting, the remainder of the evening was devoted to the election of officers.

B. C. Nash, D.D.S., *Secretary.*

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

The third annual meeting of the National Association of Dental Faculties will be held at Niagara Falls, at 2 P.M., on Monday, August 2, 1886, instead of Wednesday, the 4th, as previously announced.

H. A. Smith, *Secretary,* Cincinnati, O.

C. N. Peirce, *President,* Philadelphia, Pa.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

The annual meeting of the National Association of Dental Examiners will be held at Niagara Falls, on Monday, August 2, 1886, at 11 A.M.

Geo. H. Cushing, *Secretary.*

BOSTON DENTAL COLLEGE.

The nineteenth annual commencement of the Boston Dental College was held in Parker Memorial Hall, Boston, Mass., Wednesday, June 30, 1886, at 7.30 P.M.

The annual address was delivered by George Makepeace Towle, and the valedictory by George L. Marshall, D.D.S.

The degree of D.D.S. was conferred on the following graduates by I. J. Wetherbee, D.D.S., president of the college:

Willis Frederick Barnes,
Fred Arlington Boynton,
Albert Frank Cate,
William Stuart Cotton,
Harry Edward Cutter,
Augustus Michael Dignum,
Miller Stephen Elkins,
Willis Ira Foss,
Charles Francis Harris,
Horace Almon Jones,
William Joseph Kelly,
James John Lilliott,
Zenas Russell Luce,
Horace Nelson Moore,
Edward James McGovern,
Augustus Mickel,
George Lyle Marshall,
James Rufus Piper,
Fred William Rafter,
Moses Manson Sanborn,
Frederic Willis Smith,
Edward Jones Weeks,
George Washington Weld,
Fred Minot Wetherbee,
George Henry Woodbury.

VIRGINIA STATE DENTAL ASSOCIATION.

The annual meeting of the Virginia State Dental Association will be held at Natural Bridge, Va., August 10, 1886.

Special rates have been made with hotels and railroads. A series of clinical lectures on crown and bridge-work (with illustrations), on electrical apparatus, and on mechanical and operative dentistry will be delivered. The meeting will probably be the largest and most interesting ever held in the State. Dentists from adjoining States and members of the Southern Dental Association, which meets at Nashville the previous week, are specially invited. The hotel accommodations and railroad facilities are ample.

J. Hall Moore, *Cor. Secretary*, Richmond, Va.

EDITORIAL.

A SUPPLEMENTAL CONTRIBUTION.

To prevent possible criticism on the part of subscribers that the reading pages of The Dental Cosmos are subordinated to the interests of the publisher, we have added a form—sixteen pages—to this number, in order to present the article entitled "A System of Crown and Bridge-Work." The various methods, adjuncts, and appliances depicted and described aggregate what is justly termed a "system," and make a valuable contribution to progressive dentistry. As, however, some of the necessary illustrations are of goods manufactured by the company publisher, we prefer to add the extra pages required for the insertion of the article.

CROWDED OUT.

Owing to the pressure upon our pages, we have been obliged to lay over various matter already in type, including papers by Drs. Morsman, Thompson, and Reese, and the proceedings of the New York Odontological Society.

BIBLIOGRAPHICAL.

Pamphlets Received.

Circulars of Information of the Bureau of Education. No. 5, 1885: "Physical Training in American Colleges and Universities." By Edward Mussey Hartwell, Ph.D., M.D., of Johns Hopkins University. Washington: Government Printing Office, 1886.

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PERISCOPE.

Resorption of Tissues.—Nature is conservative, retaining only such tissues in the body as are productive of benefit to the animal economy. The process of resorption is constantly going on; cells and tissues, having performed their life-work, are continually being broken down and removed by and through the lymphatic system. It is not to these conditions, however, that I now desire to direct attention, but to the removal of the products of inflammation, blood-clots, ligatures, and foreign bodies of every nature that become embedded in the tissues of the body. The removal of such substances is dependent upon the action of specialized cells, called resorptive or *giant-cells*, and the process is physiological. The foreign body acts as a stimulant to cellular activity. The foreign substances act as local disturbers of the equilibrium of the circulation: there is called to the point of irritation greater supply of blood than is normal. This results in partial stagnation, and, as a further result, exudation of white blood-cells occurs, the extent of the exudation being dependent upon the extent of the local irritation.

In the case of small particles, such as coal and stone, etc., the white blood-cells take them up by flowing around them and carrying them to a neighboring gland, where they are deposited.

Insoluble substances, if not in a high degree irritant to the surrounding tissues, may be encapsuled and held in the tissues. But, nevertheless, nature makes an effort to remove them. The migrated cells which form the hyperplastic granulation-tissue of circumlocution contain many multinucleated cells, the product of rapid cell-multiplication. Fleming has established beyond dispute the fact that cell-division is dependent upon nucleus-division. In some instances, however, the nucleus divides and a subsequent division of the cell does not follow. In this case multinuclear or *giant-cells* are formed. We do not know positively why cellular activity results; but it is probable that the cells are stimulated to an increased assimilation of cell-pabulum. But an increased supply of nutrition does not always produce giant-cells. Some authors hold that giant-cells or *osteoclasts*, found in connection with resorption of bone, are produced from the liberated bone-cells; but the fact that giant-cells appear in connection with the resorption of dead bone and other hard tissues which do not contain living bone-cells seems to establish for them an independent identity. Ziegler, when speaking of the erosion of bone, uses the terms osteoclasts, giant-cells, and resorption-cells as synonymous, and asserts that they arise from multiplication of exuded white blood-cells.

The presence of giant or resorption-cells is general where tissues are to be resorbed, whether it be in the normal development of bone

or in the resorption of the roots of temporary teeth. Here they act as nature's physiological agents in the removal of tissues which have served their life-purpose. In fact, all the processes of nature are physiological; her agents—cells—are developed to perform well-known physiological actions, and when a pathological result is produced it has its origin in some outside influence. Cells have not the power to produce pathological results unless stimulated by some agent which lies outside of physiological bounds, and when so stimulated they act through their own peculiar channels. Many physiological processes present pathological appearances; but when we study their deeper expressions we find that they are purely physiological. I look upon giant-cells as nature's physiological agents, by whose aid she removes tissues which have performed their life-office, or which by their presence are hurtful to the animal economy.

The resorption of tissues through the agency of giant-cells is therefore to be regarded as a purely physiological process. The pathological phase is found, not in the removal of the tissue, but in the irritant which preceded the resorptive process and made it necessary. Thus far, too much stress has been laid upon the visible expression of nature's effort to remove the irritant, and too little on the character of the irritant itself. Pathological results may attain to the resorption process through the action of giant-cells by reason of the juxtaposition of healthy tissue. Nature, in her effort to remove the irritant, acts upon the surrounding tissue. This probably occurs more or less in all resorptive processes; it is, however, incidental.

Giant-cells are found in disease where great cellular activity exists, —as, for example, in miliary tuberculosis, syphilis, myeloid sarcoma, and hyperplastic granulation-tissue; they are also found in connection with the resorption of bone in normal development, the roots of temporary teeth, and other bodies that nature desires to remove. They are developed in all the above-named cases, unless the exuded cells are destroyed and a purulent condition produced.

In caries of bone due to extension of constitutional diseases, such as tuberculosis and syphilis, it seems to me that it is perfectly rational, from the knowledge we now possess of the specific vices of these diseases, to say that the cause of irritation lies in the micro-organisms which are found in connection with them. The case is not altogether clear for syphilis, but no doubt exists regarding the direct connection between the tubercle-bacilli and tuberculosis. Nature seeks, by the destruction of local territories, to limit the action of the irritant, and when *caries* accompanies this process it is often the indirect and not the direct point of attack.

In myeloid sarcoma, though gaint-cells are present, we have as yet been unable to demonstrate any local irritant. That such a condition does exist in connection with the disease I have no doubt. The action of the giant-cells is the same in all cases: they secrete a fluid which has the power of digesting the tissues in their immediate neighborhood. In claiming this attribute for them we do not go beyond the physiological action of cells.

The process of digestion is well known to every student of physiology. In the stomach glands secrete certain fluids by whose

action that which we call food is so changed that it can be taken into the blood and assimilated by different parts of the body. A failure on the part of these glands to produce their normal fluid will cause what we term indigestion. Ordinary food-stuffs, unless prepared and dissolved by the fluid secreted by the glands of which we have been speaking, cannot be assimilated. We find that what is true of the digestion of food is also true of the digestion of tissue. In order that a tissue may be removed, it must first be digested by the cell-fluid, after which it can be taken up by the lymphatic system. It is true that very small particles, by reason of their minute sub-division, do enter the lymph-channels; but they are not assimilated into the general system; they are deposited in the first gland into which the lymphatic empties. Instances of this kind are found in cases of respired particles of coal and stone-dust, and as a consequence we have the pathological condition known as the "coal-miners'" and "stone-hewers'" lung.

As I have already said, in order that any tissue may be assimilated it must first be digested. In the cases above mentioned the soluble ferment is secreted by the giant-cells at the point of irritation.

The juxtaposition of the secreting cells and the tissue to be resorbed is a matter of essential import. The ferment or fluid in question is not an exuded fluid of the blood; it is as truly a specialized fluid as are the secretions of the peptic glands of the stomach. The nature of the body to be resorbed has no more influence in the production of the secretions than have the various food-stuffs which are taken into the stomach over the secretions of the stomachic glands. Resorbed and resorber must be in actual contact, as is seen in every instance where tissues are to be removed.

Such are the facts, briefly stated, from which I have drawn the conclusion that the resorption of bone in normal development, of the roots of temporary teeth, of provisional cartilage, of sponges in sponge-grafting, of catgut ligatures, of blood-clots, and of all foreign bodies that are capable of digestion is a physiological process, and is accomplished by and through the agency of resorptive or giant-cells.—*W. Xavier Sudduth, M.D., D.D.S., in Philadelphia Medical Times.*

Epilepsy from Diseased Teeth.—The following case of epilepsy, caused by the irritation of a diseased tooth, is reported by Dr. Schwartzkopff, of Eisenach, in the *Deutsche Monatsschrift für Zahnheilkunde:* A man, aged twenty-seven, suffered severe pain in the right upper central incisor, which was carious, and consulted a dentist, who filled it. Soon after a swelling appeared on the hard palate in the neighborhood of the tooth. This increased in size, spreading backward until it reached the soft palate, where an opening formed. The patient was now again easy, but the tooth continued loose and tender when touched. The fistula also remained patent and discharging. Ten days after the tooth was filled the patient had an epileptic attack, and these recurred at gradually shorter intervals until, at the end of eighteen months, they occurred several times a week. During this time the patient was treated with bromides, atropine, etc., but without result. The tooth was then extracted, the fistula healed, and the fits ceased; and at the time of reporting the patient had remained free from them for four years.—*Jour. British Dental Association.*

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ORIGINAL COMMUNICATIONS.

FILLING TEETH AND FILLING-MATERIALS.

BY ALTON HOWARD THOMPSON, D.D.S., TOPEKA, KANSAS.

(Read before the Nebraska State Dental Society, at Beatrice, Neb., May 19, 1886.)

IT is a wholesome indication of the progress of the times that papers and discussions in our societies are taking the turn of dealing with the practical and simple things of every-day practice. The scientific wave which has swept over the profession of late years is about to be succeeded by a practical wave,—an application, as it were, of the science in practice. These waves of theory and practice alternate, and rise and fall with a more or less regular cadence and a mutual compensation, due to reaction upon each other. And so, as a contribution to the practical wave now bursting upon us, the practical subject of filling teeth and filling-materials has been selected for this paper. These are of the simple things which do not receive the attention their importance warrants. They are of the ordinary things which are so commonplace that we give them little or no thought, while we perform them in a sort of automatic way after a conventional manner. But the operation of filling teeth, which occupies the most of our working hours, is so very important, both to ourselves and to those whom we serve, that we cannot dwell upon and discuss its details too much,—if by so doing we may receive or give anything that shall enable us to do it better and save more teeth.

To begin with, the operation of filling teeth may be defined as one which consists of removing the decomposed tooth-substance from a cavity of decay, and the filling of that cavity with some material which shall effectually prevent recurrence of the disease at the same place. Many details and variations enter into the process, as cavities differ. Of course all simple cavities can be classified

roughly, and one kind of operation will answer for all of one class; but, unless these are strictly simple, the least complication takes them beyond the rule of thumb, and each cavity becomes a law unto itself and must be treated by itself. In view of this, the capable dentist must be something more than the mere automaton, which could perfectly plug the uniform holes in pieces of ivory just as they came. But, as the holes in teeth present infinite variety, they must be dealt with with intelligent judgment at every step in the process of treating and filling.

The first step in proceeding to fill a cavity of decay in a tooth is to obtain access to that cavity to permit of free working. In the anterior teeth, where the cavity is upon the approximal surface, the first thing is wedging to separate the teeth. The palatal wall is then chiseled down to admit the burs and excavators. In the approximal cavities in the posterior teeth wedging is not always admissible, but the file and disk will usually be required to make space at once. Access for the instruments will be obtained by cutting down the grinding wall, then burring this opening into a dovetail with fissure-burs. Sometimes, though rarely, it is better to enter approximal cavities from the buccal side; but good work cannot usually be done unless they are well exposed by being located toward that side. Cavities upon the masticating surfaces of the bicuspids and molars are opened first with the chisel along the fissures and through the weak walls, followed by the fissure-bur. Cavities in other positions on the teeth must be cut down at the edges to the solid walls, unless cement is to be used, when weak portions may be left which it will support.

The next step is cleaning the cavity of carious matter with excavators and burs. It is well to remove the most of the carious matter before adjusting the rubber dam, that the patient may be required to endure the latter discomfort as brief a time as possible. The rubber dam is then applied, first punching holes for those teeth only which are to be exposed. It is slipped between teeth which are very close with waxed floss silk. Where there is danger of its slipping off a bead tied in the ligature will help to hold it on, and this can be reinforced with cotton and sandarac. This is also a good expedient for accidental puncture. Where there is great difficulty in keeping the rubber dam on the back teeth the clamp is allowable; but for ordinary places it is an inexcusable barbarism.

Having adjusted the dam and removed all the visible carious substance from the margins of the cavity, it should be bathed with carbolic acid, which, in addition to its antiseptic uses, will usually bring out the soft places by rendering them darker. But as this test cannot be relied on to reveal all the defects, it will be necessary

to go over the margins well with a fine, keen excavator, feeling for the chalky places, which should be well burred out. The solid carious dentine is to be left in the direction of the pulp after having been well sterilized. If the pulp is nearly exposed, it should be covered with a piece of soft, porous paper wet with carbolic acid, and over this thin phosphate cement is flowed. All cavities of depth should be filled with cement, and after hardening sufficient cut away to insert the durable filling proper. Where the pulp is approached, this cement will protect it from thermal changes and the force of filling. Where the wall is frail,—as in the anterior walls of approximal cavities in the incisors, or the buccal walls in bicuspids and molars,—the cement will support and give such walls strength, and preserve the tooth-substance where exposed to view. When cavities on the grinding surface of bicuspids and molars are deep, and the walls frail and shelving, it will protect and support them. Indeed, the uses of cements in deep portions of cavities are numerous, but judicious selection must be exercised, for the thinness of the walls and the quality of the teeth must be considered at all times.

The next step will be the preparation of the cavity for the retention of the filling. In the anterior teeth approximal cavities will require a slight groove at the cervical border, which should be deepened at the ends into a sort of pit. This pit should not be a tap drilled into the tooth-substance for a quarter of an inch to chip the enamel and weaken the walls, but a depression a little deeper than the groove, just sufficient to secure the first portions of gold and prevent rocking. As the caries will have made a groove along the labial wall, none will usually need to be cut there; but one must be made along the palatal wall toward the center of the tooth, and a pit-like depression toward the corner of the tooth-edge, thus completing the opposing retaining-points. Great care will be required in cutting toward the corner that the enamel be not checked or weakened. If it is weak or becomes cracked, it had better come off at once, for it will surely do so after the filling has been in use, and lead to its ruin. The corners break away sometimes when we consider them strong, and we must take no risks that we are aware of. A weak labial wall supported by cement is safer than a weak corner. Approximal cavities in the posterior teeth will need to be grooved from the grinding face opening, with as little undercut toward the sides as possible, although caries will often make this undercut. In other positions the shape made by the disease will usually leave the cavity well formed to retain the filling; but where the edges are shallow, pits or grooves must be made that will oppose each other. Regard must always be had to the opposition of retaining-points, that the filling may be secure against the lifting of

expansion or the capillary effects of the fluids within and without the tooth. The forces which act upon a filling to cause its expulsion are so strong that all the security possible must be given to the filling. The edges of the cavity should be beveled and polished as well.

The next step is the introduction of the filling. Beginning with gold, the first layers are employed unannealed, and are pressed well into the cervical grooves of approximal cavities or the posterior points of other cavities, and condensed with small points with little force by a heavy mallet. Foil is then annealed, attached, and condensed in thin layers, well worked over. Small cylinders, or pieces torn from larger ones, are then condensed in the same way, to build up the bulk of the filling; the margins being carried up with the semi-cohesive foil. Large cylinders are condensed on the outer surface with larger points to give a finishing surface, as the small points might make the filling pitted. But in no part of the process of condensation is *much* force used. Gold is too often introduced in such large pieces that great force is required to condense it, and with a doubt as to this being thoroughly packed or the pieces being well welded. After-flaking of the gold is a result of using large pieces and imperfect malleting. The safe plan is to work it on in small pieces with small points and light blows. The tooth is spared the jar and strain, cracking of the enamel is avoided from the forced expansion of the filling, and in working the touch is a complete guide as to condensation.

After the filling is introduced it should be well burnished with strips, tapes, disks, stones, and polishing-powders. The gold should be frequently burnished during the process of finishing to eradicate all irregularities, and a fine burnish should be left upon it at the last, that food may not lodge upon it. But in exposed places this burnished surface should be frosted with pumice, to give a dead, unreflecting surface. The platinum and gold combination makes a harder surface than gold alone, and should be used upon the edges of incisors and the cusps of cuspids and bicuspids,—*i.e.*, for all "shoeing" of the worn ends of teeth. It promised well at first, as furnishing a gray finish for exposed surfaces of fillings; but patients object to having "tin teeth," as they call them, so that they will rarely consent to its use in visible locations, preferring the pure gold.

In approximal cavities of the bicuspids and molars it has been the writer's custom for a number of years to line the cervical margins with a good layer of tin foil. This is accomplished by flattening a tin cylinder of the proper size, and cutting a proper length off from it, which is condensed flat against the cervical border. A long experience with this method has demonstrated that it is good

practice. The therapeutical qualities of tin, its oxidation and hardening of the dentos at that place, and its combination with the gold, makes the filling more durable at the most vulnerable point of approximal fillings—the cervical edge. It makes a better joint than soft gold, is besides a better preserver of tooth-substance, and experience has abundantly testified to the value of this expedient.

For filling with amalgam the cavity need not be so strongly shaped, nor be made so directly accessible, and the overhangs need not be cut away as much. But there is much to be learned yet to make good edges; for, although amalgam fillings last well, the edges do not remain sightly, and will finally leak. The filling should be polished well after it hardens,—the next day, or as soon thereafter as possible, for many failures with this material are due to the neglect of this rule. Protrusions of the filling at the cervical border, as waste pieces floating back and becoming attached to the filling, make irritating points which cause inflammation of the gum-margin, or catch and retain food and débris, the decomposition of which leads to recurrence of the disease about the filling. Besides, the filling cannot be finished nor polished until it has become hardened, and no good workman will let his work go unfinished.

The question of precise discrimination in the use of filling-materials is one that does not now agitate the professional mind as it did in the days of the "New-Departure" controversy. In the selection of the proper materials that faculty called judgment must be called into active employment in almost every case. There are very few cavities that can be prepared and filled by rule, for almost every one makes a demand upon the intelligent judgment of the operator. Sir Joshua Reynolds said well in regard to painting, that "genius begins where rules end," and this truism might be applied with equal force to dental operations. It is the genius of discrimination that makes the successful dentist, for, beyond all men, he cannot work by the rule of thumb.

Gold should be employed in all teeth which will bear it. That is the simple rule. But in practice, in the application of the rule, there will be found all kinds of difficulties in the way of proper discrimination between the teeth which should and those which should *not* be filled with gold. But year by year the noble metal is gaining on the plastic materials; for, by means of improved preparations of gold, improved instruments and better methods, we are enabled to fill and preserve teeth which could only be saved by the plastics, even as late as the days of the "New Departure." At that time cohesive gold was used almost exclusively and indiscriminately by all gold operators, with the result that they had very many failures; and it was these failures that gave the "New Departure" movement

its being and its phenomenal activity. We have, however, learned many things even since that time in relation to gold, to methods, to instruments, and as to the filling qualities of teeth. We discriminate very closely now, and without prejudice, for or against any *ism* or *pathy*, and the line is being constantly tightened. In the first place, we have learned that all teeth should be filled with gold which have sufficient density of structure to allow of proper contact at the margins and perfect condensation of the gold; and there are very few teeth which will not permit this. Where walls are weak, a supporting lining of cement will strengthen them sufficiently to allow of careful condensation with small points and light blows. The increasing use of soft gold is giving us new victories over the plastics, and extending the encroachment on their domain. Unannealed gold should be used against all margins, as it gives better contact than the cohesive gold or annealed. The expedient of lining the cervical wall with tin is also assisting the usefulness of the noble metal.

Gold is and will remain the king of filling-materials, and the practitioner of the most mediocre ability is using it more and more. As he learns to preserve more of the teeth with the plastics which he formerly extracted, so now he is also ambitious to extend his knowledge of gold filling and increase his practice of it. When the most ordinary dentist is ambitious to do fine work, and that ambition is fixed habit, he is a saved man. By persistent study and the practice of better methods, he will soon be lifted above mediocrity, and his further progress is then assured. Just as sure as that he is desirous of progressing, will he develop and improve. No man is so poor a workman, or so unpracticed a student, or so illiterate, but that, with a sincere desire to improve himself, he may attain a degree of ability that will be a pride to himself and friends; and in the use of gold for filling no man is so unfortunate in early training but that, by proper study and application, he may attain a respectable ability.

Amalgam may be employed where gold cannot, for various reasons, be used for filling, and will serve a good purpose as a preserver of carious teeth. In cavities which have hopelessly soft margins—as often occurs on the buccal faces of wisdom-teeth—it makes a better filling than gold. In large approximal cavities in the molars or on the grinding face, when the entire tooth is soft and weak, and the only alternative is extraction, it can be employed to preserve such teeth for years. But the use of the gold shell crown nowadays is rescuing such teeth from amalgam in the practice of the best dentists. These places are about all that are left to amalgam now, for gold is crowding it to the wall in almost every direction. Of course, its use in children's teeth must not be forgotten. It is the best for the milk teeth, and also for the first and second

permanent molars until they attain the hardness of maturity, when it can be replaced by gold. Gold is not so serviceable in the soft teeth of childhood and adolescence.

Of course, in ordinary dental practice, there is the irregular use of amalgam where we are compelled to insert it in all sorts of cavities in the posterior teeth on the score of economy to the patient. This is not putting it on its merits, and is therefore more or less illegitimate, and is a mere expedient. The patient should be impressed with this fact, that when used for economy it is only an expedient, and that just as soon as he can afford it the amalgam should be removed and gold inserted, and that the operation cannot be considered complete until this is done. It is very nice to talk about filling the teeth of the poor with gold at any rate, for charity's sake; but there are very few of us who can afford this lovely benevolence. In ordinary practice we are still compelled to use amalgam for the sake of economy, for it *is* better to fill with that much-abused material than not to fill the teeth at all.

Phosphate cement is coming into prominence now as a permanent filling-material, and is so much improved that it often answers an excellent purpose as a durable filling. It is of especial value in children's teeth, which in the mere babies cannot have any preparation whatever; and at the other extreme of life, in the senile softening and decay of the teeth of the aged, when any protracted operation is equally inadmissible, it serves an excellent purpose and lasts well. In the mere shells of teeth for ordinary adults it also does well,—especially in the anterior teeth. The preparation consists in the removal of the carious matter, except over the pulp, which should be protected by the carbolated paper. A *white* cement should then be placed over the inside of the thin walls toward the visible portions of the tooth, for color; then soft cement run over all the interior, and the filling completed with a proper shade of cement, used stiffer. It is dusted with the powder and covered with a varnish to exclude the moisture as long as possible, the mouth being held open till it is nearly dry, and the filling trimmed and smoothed at a subsequent sitting. Such fillings made of the *best* cements will last for years in most mouths; but there is such a difference in the soluble qualities of the saliva that it will dissolve away partially in some mouths and require repairing. With a continuance of the present rate of improvement in the cements, however, the next generation will possess such a filling-material as will be sufficiently durable to displace amalgam altogether.

The writer is in the habit of using the cements extensively for temporary fillings for the treatment of sensitive dentine. This method of overcoming the greatest obstacle to filling teeth is better

and safer than any other yet discovered. The cavity is cleaned as much as possible but not prepared, then carbolated, and the cement inserted soft but well. This is left for a month or longer, when the sensitiveness will be found to have subsided sufficiently to permit of comfortable and often painless operating, and the filling can be completed with satisfaction to all concerned. There is also no after tenderness to thermal shock, and the pulp is not endangered by this cause, nor by working when the tooth is in an irritable condition. The probation allows all irritation to subside, and the parts to return to a normal condition. In addition to these and other advantages, the phosphate has the effect of hardening the walls of the cavity, and thus improving the texture of soft teeth, so that they can be filled better with gold. Indeed, soft teeth should always be treated with cement in this way before attempting to fill with gold. As an economical expedient, the cavities in a denture could all be filled with phosphate cement to preserve the teeth from immediate danger, and filled by one or two at intervals as the patient's means will permit, thus distributing the expense. This is a much preferable method to filling with amalgam for economy's sake, for the amalgam is so durable that the patient will often not have it replaced with gold when his means will permit.

DENTAL CARIES.—XI.

BY A. MORSMAN, M.D., D.D.S., IOWA CITY, IOWA.

(Continued from page 405.)

PART THIRD—SEQUELÆ.

4. Lesions of the Periosteum—(Continued).

Alveolar Abscess.—We have already discussed acute alveolar abscess in connection with and as a result of periostitis, with which it is so closely connected that it is more easily considered under that heading. It remains now to consider the chronic form. Unlike abscess in other parts of the anatomy, the disease here *never*, in my opinion, terminates unaided in resolution. Pus once formed continues to form until, through treatment, the pus-forming surface or pus-sac is destroyed. The quantity of pus discharged may be almost imperceptible, but if the root-canal be closed tightly the recurrence of severe symptoms demonstrates its existence, *except* there be a fistulous outlet, the mere existence of which proves the presence of pus.

There are two varieties of this disease, differing only in amenability to treatment and in the location of the pus outlet. In one the outlet or sinus is through the root-canal; in the other there is

also a fistulous track through the wall of the alveolus and the overlying gum near the apex of the root, and usually upon the buccal or labial surface, where it presents the appearance of "gum-boil." This fistula *may* occur elsewhere, as will presently be seen.

Pathology and Clinical History.—Chronic alveolar abscess is either the continuation of acute abscess resulting from acute periostitis, or it is the termination of chronic periostitis. From the former it results naturally, as an abscess once formed here never resolves itself, but continues to discharge pus after the acute symptoms have subsided. From the latter it is to be expected as a result of long-continued irritation. When a fistulous track has formed acute abscess has been the precedent. If there is no fistula, then the inflammation and subsequent abscess have been always chronic in character, with perhaps subacute exacerbations.

The quantity of pus discharged is usually small, and patients are often entirely unconscious of it. Others complain that the "tooth tastes bad." In exceptional cases the quantity is large and very offensive, contaminating the breath of the affected person to such an extent that he becomes obnoxious to others.

There is ordinarily no pain or uneasiness in the tooth; but occasionally, from some stoppage of the outlet, changes of weather, cold, damp feet, malarial influences, or overwork, the tooth aches. This pain is not usually of the acute variety, although it may be so if the cause is of sufficient potency to bring about a return of acute inflammation. It is dull, heavy, and, to use the patient's common expression, "grumbling." It may last for several days, and then the tooth returns to its previous condition; or there may be a constant "soreness" in the tooth that is but little more than a consciousness of its existence. It is astonishing how great a number of such teeth there are, and how long they are silently endured. Ordinarily they produce only local effects, but at times they do vastly more. Diseases of the eye, the ear, and the antrum are caused by them. Fistulæ through the cheeks, leaving unsightly scars and severe *complicated* lesions, are occasional results.

If in extracting an abscessed root we are so fortunate as to extract the abscess entire, we find a highly vascular sac, into which the apical foramen opens. This seems to be a thickened dilatation of the root-membrane, and its interior is a pus-secreting surface. Many authors deny the existence of a pyogenic membrane, but this would seem to be a veritable example of it. The root in the interior of this sac is often very rough, and is denuded of its periosteum. There is always more or less absorption of the alveolar walls, and frequently so much inflammation of the alveolar periosteum that pain is quite persistent after the tooth has been extracted. Necrosis of

the maxilla is a not infrequent result, and may be very extensive. Necrosis of the tooth-root may also occur, but more rarely. The fistulous track, when one forms, does not always take the most direct route, but may open at a point very remote and unexpected, as upon the chest, neck, cheek, through the nose, over the palate, or into the antrum of Highmore. Abscess thus becomes at times a complicated lesion of serious import, but as the writer designs to treat only of the teeth and not of their surroundings these anomalous lesions are beyond the limits of this work.

Diagnosis.—This should be by exclusion. Having determined that the pulp is dead, and that the symptoms are insufficiently severe for periostitis, any other tenderness of the tooth to pressure, masticating force, or tapping with an instrument should at once excite *suspicion* of abscess. It has been often stated that the odor of alveolar abscess is diagnostic. This is only true after the canals have been thoroughly cleaned and purified. The same odor exists when the pulp-canals are filled with putrefying pulp-tissue. We rarely ever get the odor of fresh pus in these cases. It is the odor of putrefying pus. But if this odor returns at the next sitting after cleansing the canals there is a reasonable certainty of abscess. There is no difficulty in diagnosing abscess with fistulous opening unless the opening has healed, and even then the scar is often plainly visible. A history of "gum-boil" can also be obtained from the patient. The presence of pus, however determined, is of course conclusive. Tapping with an instrument produces slight pain, but this symptom is common to so many conditions that it is very delusive.* Certainty in doubtful cases can be attained by sealing the canals tightly after they have been cleansed. If abscess exists, a few days of this treatment will produce acute inflammation, which can be immediately relieved by removing the stopping.

Treatment.—The two varieties of alveolar abscess demand entirely different methods of treatment. The principle is the same in both. The end sought is the cauterization or instrumental destruction of the pus-sac, but this is much easier attained when a fistulous track has been formed through the process than when the discharge takes place from the root-canal. The reason is, that in the former the abscess is simply a dilatation of a fistula beginning in the pulp-chamber of the tooth, and ending at the external open-

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* There is something to be gained by "tapping." If a sound tooth be tapped with a metal instrument, it gives out a clear, sharp tone, and there is no tenderness; but if there is any lesion of the periosteum, even slight, the sound is a dull thud, readily recognized after once comparing with that of a sound tooth. Neither an empty canal nor pulp disease changes this tone *if the periosteum is healthy*. *Tenderness* on tapping may exist in any pulp or periosteal lesion.

ing through the gum. Medicine can be readily introduced here, because as it enters, the contents of the fistula pass out at the other end. In the latter the track is only from the pulp-chamber to the abscess, and the entering medicament meets with resistance from the air, débris, etc., already occupying the space, and the smallness of the canal does not permit one to go out as the other goes in. This latter form of abscess has been called "blind abscess,"—a very inappropriate designation.

In treating "*abscess with fistula*" the root-canal is first pumped full of the selected caustic,—carbolic acid, iodine, chloride of zinc, or creasote and iodine in combination,—and then a pellet of cotton is saturated with the same and placed in the mouth of the canal. A piece of ordinary rubber base-plate is cut and molded to fit the cavity tightly, and upon this with a large-faced instrument pressure is exerted in a pumping manner until the cauterant shows its effect at the fistulous orifice, over which a bit of spunk had been placed to shield the cheek or lip. Whenever this result is attained a cure has been effected, and the root can be immediately filled. If this cannot be done,—and sometimes failure will follow repeated efforts —the case should be classed for treatment under the following:

"*Abscess without fistula*" is much more difficult to manage than the above. A method of treatment in common use is called "forcing." In this acute inflammation is sought, and it is brought about by tightly closing the root-canals and keeping them closed until the process is penetrated, when it is then treated as above described. Of course, all the symptoms and sufferings of acute periostitis are developed. I never practice this method, and do not indorse it. To my mind it is most unkind, unnatural, and *unskillful*. To put a patient through such suffering to save a tooth when it can be more easily done is barbarism. The forceps would be better treatment.

A modification of the above is to alternately stop the tooth until the symptoms become quite severe; then to open it, repeating until a fistula is formed. This is very slow and tedious, and is not very commendable.

The surgical method is to drill through the alveolar plate, and thus make a fistula. This is not at all difficult, and is only slightly painful. A spear-shaped drill or trephine is used, either by hand or engine, and after cutting through the gum with a scalpel* the bone is perforated as near the location of the end of the root as can be ascertained. Care should be taken that the drill does not go further than through the plate of bone over the tooth. I extracted one

* Since the above was written Dr. Rollins's tubular abscess knives have been placed on the market. They greatly facilitate this operation.

tooth that had been treated in this manner, and found a hole drilled through the end of the root. Having made an opening, the case is now abscess with fistula, and can be so treated; or the abscess can be broken up by a bur or other instrument through the artificial sinus. Into this introduce a tent of cotton saturated with a ten per cent. solution of carbolic acid. A cure will sometimes follow this breaking up of the abscess, without subsequent treatment.

Another method is cauterization by vapor. I have never seen a description of this method, although I believe it is in quite general use. My own knowledge of it was original with myself, and was derived from experiment. I practice it as follows: First cleanse the canal thoroughly and pump it full of carbolic acid. Dip a twist of cotton-rope in the same, and taking one end of it on the root-canal plugger, pack the root full; over this put a small, dry pellet of cotton, and seal the pulp cavity *tightly* with gutta-percha. Allow this to remain three days; remove it and repeat the operation, using tincture of iodine instead of carbolic acid. Allow this to remain for a week unless marked soreness occurs. Continue this treatment, making the time longer for each succeeding application, until four or five applications have been made, or until the tooth will bear stopping for two weeks without tenderness. Excessive soreness should not be allowed at any time, and the patient should always be instructed to return whenever soreness is much increased. I seem to be more successful in using iodine and carbolic acid alternately than in using either alone. Iodoform can also be used in this way by means of a solution in ether. Its bad and persistent odor is an objection.

Peroxide of hydrogen is highly recommended. I have had but little experience with it. It is used either alone or in combination with a very weak solution of corrosive sublimate. It seems to me to be more applicable to abscess with fistula than to the other variety. In such cases it is injected after the manner already described.

In case all methods fail, or when the root or tooth is of no use for pivoting artificial substitutes, the proper remedy is the extraction of the offending member.

Amputating the end of the root and replantation have both been recommended in obstinate cases. I have but little confidence in the ultimate success of either method.

Chronic Ulceration.—The condition which I am now about to describe has been so confused with abscess that the literature of the subject is of but little value. Abscess has been called ulceration and ulceration abscess, and the difference in pathology and treatment has not been well defined. I am not quite certain that the term "ulceration" properly expresses this condition, but it seems to

me to be in a measure an ulcerative process, and as the term has been already used in this connection I consider it applicable. We stand greatly in need of further light upon this subject, and I think when it has become generally understood that abscess is not the only periosteal disease located at the extremity of the root, a step will have been taken that will lead to investigation.

Clinical History.—I am unable to give the origin or causes of this disease, but believe them to be not dissimilar to those of abscess. I also believe that a sluggish abscess may become an ulcer, and that the two conditions may be at times combined. Probably the most frequent origin of ulceration is the retrograde metamorphosis of an abscess. I think ulceration never or rarely exists where there is a fistulous opening, and that it may and often does exist where there is no external opening through process or root-canal.

The course of the disease is very similar to chronic abscess, differing mainly in the character of the discharge, which is very slight, thin, and watery. This has no odor except when it has become putrid, and has the appearance of serum rather than pus. The quantity is very small,—so small that it might easily escape observation. If the root-canal has been open it can often be closed without producing severe symptoms, although pain and soreness of the tooth will be likely to result. If there is no external opening,—as, for instance, where this condition has been post-operative, and the canal be subsequently opened,—a quite frequent result is acute ulcerative action involving the entire periosteum, the discharge occurring *around* the tooth. In such a case the tooth becomes very loose, and the swelling excessive and of longer duration than in abscess.

In ordinary cases there is but little if any tenderness of the tooth, and it will bear tapping and pressure remarkably well. Frequently the only way that the patient can detect such tenderness is by comparison with a sound tooth.

A very common accompaniment of ulceration is tumefaction. This presents at the apex of the root, usually upon the labial or buccal surface, although I have seen it once upon the lingual surface, in the case of a lower bicuspid. The tumor is readily felt by the finger, is movable, and gives slight pain upon pressure.

While this disease is tolerably frequent as a sequel of caries prior to operation, my experience leads me to believe that it is more commonly the result of imperfect pulp-extirpation and root-filling.

Diagnosis.—It is quite difficult to differentiate between chronic ulceration and chronic abscess, the symptoms and many of the physical signs are so nearly identical. The scantiness of the discharge and its character must be our main reliance. The tumefaction, when it exists, I believe to be pathognomonic, but, except the

canal be closed, there may be no tumefaction, and we are therefore unable to avail ourselves of this aid in all cases.

TREATMENT.—Ulceration is much more stubborn than abscess under treatment when this is directed to the salvation of the tooth. Indeed, in my own practice, failures have been lamentably frequent, although I admit my methods have been largely experimental. Applying the same treatment recommended in abscess, I have failed invariably. This condition is a very deceptive one. With a canal freely opened and well cleansed, the tumefaction may subside in a few weeks, and success seem to be attained; but when the filling is inserted the operator is chagrined to find that he has accomplished nothing. Such being the case, we should "make haste slowly." Counter-irritation, accompanied by antiseptic packings in the root-canal, I believe to be the only course having any promise of success. If the root-canal is closed, it must be fully opened. I have never accomplished anything by surgical interference, but I have not given it a very extensive trial. Drilling through the tumor to the root, and burring out the diseased portion with the engine, would seem to be applicable. I have tried it in but one case; considerable necrosis of the maxilla ensued, for which I could not account.

Counter-irritation is applied by means of iodine, capsicum, or oil of mustard over the apex of the root in the manner already described. It should be persistent and as continuous as can be borne. Much patience will be required by both patient and operator. If tumefaction exists, pressure upon the tumor by means of a small pad retained between the lip and gum will be found of service.

The most satisfactory treatment is extraction, unless for very important reasons the retention of the tooth overbalances the accompanying discomfort. It should be borne in mind that unless an ulcerated tooth or root can be placed in a healthy condition it is a constant irritant that is liable to cause serious trouble, and it is much better to extract it than to advise its retention in such condition. I would not advise extraction, however, until assured that the eradication of the disease was not to be attained by other means.

(To be continued.)

UREMIA AND ITS EFFECTS UPON THE TEETH.

BY W. J. REESE, D.D.S., GALVESTON, TEXAS.

(An Abstract of a Paper read before the Louisiana State Dental Association.)

IN 1880 the writer became convinced that uric acid in the blood and saliva was the cause of grave trouble in the mouth, and so announced to several of his confrères. The subject is presented in the hope that it will invite investigation from the many earnest students in dentistry.

Uremia is defined as that condition of the system which follows the retention of the excrementitious urinary substances in the blood. There are many of these substances, but urea, uric or lithic acid, and hippuric acid are the principal ones. All these are found in healthy urine, urea being most abundant and the quantity relatively of the others in the order of their mention. Diseased conditions may change the quantity of each, and diet will do the same in health.

As this essay is only intended to place before the profession the action of uric acid on the teeth, the writer will adopt the word uricemia as more definite.

What is uric acid? Chemically speaking, it is $C_{10}\ H_4\ N_4\ O_6$ (urea is $C_2\ H_4\ O_2\ N_2$). It will be seen that both are composed of the same substances, only in different proportions. It has been generally conceded that both are formed by albuminous matters taken in the food in excess of what is required for the nutrition of the system, and it is claimed that uric acid can be converted into urea by drinking large quantities of water. Müller says that uric acid is formed from the white globules of the blood, and urea from the red globules. Uric acid is found in the excrement of many reptiles and insects. Miller estimated that two-thirds of the excrement of the boa-constrictor is composed of uric acid. It is abundant in the urine of birds; is found in the urine of carnivorous animals, and in that of the herbivora while sucking, and therefore feeding upon a diet rich in nitrogen. It is not found in the urine of the pachydermata.

Dr. Beale says that healthy human urine "contains from half a grain to a grain of uric acid in 1000 grains"; and probably from five to eight grains are excreted by a healthy adult man in twenty-four hours. Dr. Thudichum gives the latter as the average quantity. The quantity of uric acid excreted in twenty-four hours for every pound weight of the body is .059 grain, according to Parkes.

Dr. Prout's method of determining the presence of uric acid is to place the deposit on a glass slide, and add a drop of nitric acid; a brisk effervescence ensues, and, when the mixture is slowly evaporated over a lamp a reddish residuum is left. Upon the addition of a drop of ammonia a rich purple tint is produced, owing to the formation of murexide, the so-called purpurate of ammonia. One other substance produces a similar reaction, and this is caffeine; but uric acid is at once distinguished from it by its microscopical character.

Dr. Garrod detected uric acid in animal fluids when mere traces of this substance or of urates were present.

The fluid suspected to contain the urate is treated with a few drops of strong acetic acid (glacial acetic acid is best) in a watch-glass. A few filaments of tow or very thin silk are placed in the mixture, and the whole set aside under a glass shade in a warm place, for twenty-

four or forty-eight hours. Gradually uric acid crystals separate, and are deposited upon the filaments. Their character may be recognized by microscopical examination.

While the presence of uric acid in the blood was known, its presence in the saliva was not demonstrated beyond question until 1881, in a communication to the Academy of Medicine by Dr. Boucheron, of Paris. His method of analyzing does not differ materially from that of Dr. Prout already mentioned. It is as follows: The saliva is collected in an evaporating dish or watch-glass, and slowly evaporated over a spirit-lamp. A small quantity of nitric acid is added, and the evaporation continued. Then stir from the bottom with a small piece of wood which has been dipped in ammonia. The uric acid is thrown down in the form of a red precipitate.

The acid reaction of uric acid is very weak. It will rarely change the color of blue litmus-paper, and is readily separated from its salts by acetic and nitric acid, as already shown.

We have seen that according to the testimony of the most eminent investigators uric acid is present in and is excreted by animals —reptiles to man. So far as our knowledge goes, it does not produce any ill effects except to man,—not even to him unless retained in the blood by failure of the kidneys to perform their functions.

Food is an important factor in the production of uric acid. Commencing with the boa-constrictor, an exclusively flesh-eating reptile, we see that two-thirds of the excrement (according to Miller) is composed of uric acid. As already shown, it is found in all carnivorous animals, and is absent from those living on a vegetable diet. It can be produced in abnormal quantities in the human system by a flesh diet or lack of vegetable food. Scurvy, formerly so destructive to human life during long sea voyages, illustrates this statement.

Dr. Garrod has shown that in gout and rheumatism the presence of uric acid in the blood is constant. He says that "in these conditions the kidneys lose to some extent their power of excreting uric acid, although they eliminate urea as in health. During the attack there is less in the urine than in health; but after it is over a large quantity of uric acid and urates are often carried from the system in the urine." *

In bringing about that peculiar state of the system which causes the presence of uric acid in the blood, we find that alcohol plays an important part.

Dr. Beale says, "In cases of long continued wine and spirit drinking it is probable that the changes which ensue result from an altered state of the blood, engendered by the spirit, and not from the direct action of the alcohol itself upon the tissues. Large quan-

* "The Nature and Treatment of Gout," page 167.

tities of spirit may exist in the blood, for short periods of time, without producing any serious change in the kidneys. When, however, the renal cells have long been subjected to the influence of blood modified by the constant presence of alcohol, they lose their healthy appearance; sometimes merely becoming smaller and more condensed; sometimes becoming granular and in a state of disintegration. The kidney and liver become hard, small, and wasted. This decrease in size takes place principally at the expense of the cortical or secreting portion of the kidney and the outer, active parts of the lobules of the liver. I think it probable that if a hundred persons in good health were placed for a number of years under conditions favorable to the production of contracted kidney or the wasted state of the liver generally termed cirrhosis, the condition would be actually produced in at least 80 per cent." Remember that this condition of kidney and liver is rarely found except in those habitually using alcohol, and in the gouty and rheumatic habit of body. "This condition of the liver and kidneys is occasionally met with in young persons and in those whose habits of life have been perfectly temperate. The contracted state has even been known to affect the fetal kidney and liver. It is probable that these congenital defects are nearly always inherited, and are only dormant during childhood and youth, developing themselves in febrile and other diseases favorable to the production of uric acid diathesis." For example, Dr. P., a patient of the writer, a person of more than ordinary intelligence, of fine medical attainments, having enjoyed the advantages of both American and European education, inherited gout from both parents. He was unusually robust and strong,—so much so that while at school he went under the soubriquet of "Goliah." At the age of fifteen he was a man in stature; at which time he had a severe attack of malarial fever, which developed into a well-marked case of gout in both feet. Since that time he has suffered from uric acid troubles. His observation is that those of uric acid diathesis suffer more severely from malarial and other fevers than those who are free from this trouble.

Dr. Beale says, "In many acute febrile diseases the proportion of uric acid is increased, and the period of resolution of the inflammation is marked by diminished frequency of the pulse and respiration; by a fall of temperature, by free perspiration, and by a very abundant deposit of urates."

If this is so, and the statement of such a profound investigator is entitled to consideration, does it not open up a wide field for examination? May it not be possible that these fevers owe their gravity to the presence of uric acid in the blood?

Some of our most eminent dentists think that pyorrhea alveolaris

is caused by mercurial salivation, and it unquestionably aggravates this trouble. But mercurial salivation can be prevented by the administration of an antacid with the mercury,—bicarbonate of soda, for instance,—and salivation can be almost certainly produced by giving an acid in connection with it. Is it not probable that the presence of an acid in the system is the cause of salivation, and that that acid is uric acid? Whether it is or not, it is absolutely certain that there is less mercury given now than formerly; and there is more pyorrhea alveolaris. It is equally certain that pyorrhea alveolaris occurs where no mercury has ever been taken, either by the persons suffering or their parents. In a case of fever Dr. Parkes found that 17.28 grains of uric acid were excreted in twenty-four hours. Dr. Sansom thus estimates the quantity of uric acid in 1000 grains of the morning urine in health and in several forms of disease:

	Grains.
Health,	.250
Acute gout,	.830
Acute rheumatism,	.802
Heart disease,	.711
Erysipelas,	.679
Phosphatic urine,	.140
Chronic gout,	.120
Excessive debility,	.078

Dr. Beale says, "In some cases the quantity of uric acid held in solution is so great that upon the addition of a drop of nitric acid to the urine an abundant amorphous precipitate, exactly resembling albumen, is formed. Such precipitate has many times been mistaken for albumen, and, even if examined under a microscope immediately after it is formed, its true nature is not revealed; but if it be allowed to stand for some time, the amorphous particles gradually increase in size, and assume the well-known crystalline form of uric acid. The instances in which I have met with urine exhibiting these characters have almost all been cases of liver disease. In very chronic cases there is probably scarcely an organ in the body that retains its healthy state, and of persons whose deaths are registered as resulting from pneumonia, bronchitis, dropsy, convulsions, various forms of disease of the nervous system, and other conditions, not a few are really caused by renal disease."

Nasal catarrh is so often found in connection with uremic poisoning that it may be considered as a concomitant of this affection.

We find that, in considering the etiology and pathology of the hemorrhagic diathesis, it is intimately associated with uric acid troubles.

Dr. Dudley W. Buxton, in treating of this subject, says, "It is curious that, although women are not subject to the severe form of hemophilia,—that in which copious spontaneous hemorrhages occur,

—they nevertheless transmit the bleeding diathesis to their male offspring. Thus, a non-bleeder, a male, may intermarry with a woman coming from a family of bleeders, and their male offspring will probably be bleeders. Bleeders may, however, have non-bleeders as their issue. The most striking point about the etiology of hemophilism is its hereditariness. From a number of cases collected more than fifty per cent. came from families of bleeders; while twenty per cent. possessed a presumably healthy ancestry, and many were the progeny of parents who suffered from gout, scrofula, syphilis, or cardiac diseases. The hemophilic strain, if we may be permitted the expression, may last through at least six generations."

The action of uric acid upon the teeth may be called a phagedæna pericementi, as there is usually an eating away or absorbing of the peridental membrane.

The term "pyorrhea alveolaris" is a misnomer. One peculiarity of uric acid is that, while it will produce violent inflammation and intense pain, it rarely causes suppuration, except when in contact with the fluids of the mouth, and not always under these circumstances. Where the saliva does not come in contact, and where it is protected from the air, we have no suppuration on the roots of teeth. On the other hand, we very frequently meet, instead of an absorption, a bony deposit known as exostosis. You will sometimes observe the gum and alveolus absorbed from the palatal root of the superior molars without suppuration, and the labial roots apparently healthy. Extraction, however, reveals that exostosis is almost always present, especially if the tooth has no antagonist.

The observation of the writer is that while the formation of tophus on the roots of teeth is the usual concomitant of uric acid troubles it is not necessarily so. The absorption of the peridental membrane may take place without any deposit whatever. The absorption takes place before any deposit occurs, and is always in advance of it, from a sixteenth to an eighth of an inch.

I do not wish to be understood as saying that there is not a salivary calculus composed principally of phosphate of lime. You will sometimes see both this deposit and the tophus caused by uric acid on the same tooth, the phosphate being of lighter color and more porous.

Women are not as subject as men are to the severe attacks of disease caused by uric acid. But when they are irregular in menstruation, and sometimes where there is a cessation of the catamenia, as in pregnancy and nursing, we find the teeth injured from this cause. Under these circumstances, in addition to tophus, we find the festoons of the gums of a purple hue, and bleeding profusely on the slightest touch. At first this bleeding will be the only inconvenience experienced by the patient. One can oftentimes pass a probe be-

tween the teeth to the alveolus without giving any pain. The teeth in these cases are very liable to decay on the approximal surfaces, and if the trouble is not checked the usual pockets are formed, as in other stages of uricemic disease of the gums and alveolus. Suppuration, however, rarely takes place.

We are satisfied that the uric acid which dissolves the peridental membrane comes from the alveolus, and its action is the same as on the articulations and ligaments in other parts of the body when the parts are exposed to air and moisture.

The investigations of Dr. Aiguilhon de Sarrau demonstrate that the periosteum and peridental membrane are ligaments.

Quinine in small doses is good in some cases. Salicylate of soda is advised by eminent practitioners.

The local treatment consists in first removing the tophus. As this is usually readily dissolved, instrumental interference is rarely necessary. Tophus, when in the form of phosphate of lime or a urate, can be dissolved with nitric and acetic acids. The urates are also soluble in potash, soda, and ammonia. It is not advisable to use any acid in a concentrated form; and, fortunately, we have in peroxide of hydrogen all that can be desired. It will readily dissolve all recent deposits. Those containing phosphate of lime may be dissolved by adding a small quantity of nitric acid. Uric acid has a strong affinity for chloride of sodium, and we can sometimes dissolve the deposit with this substance, but it is painful to the gums, and the following dentifrice is preferable. It is almost identical with the prescription of M. Poinsot, the distinguished professor of pathology and therapeutics of the Dental College of Paris:

℞.—Prepared chalk, ℥ ii;
Bicarb. soda,
Pulv. cassia, āā ℥ i;
Spt. peppermint, q. s. to flavor.

This tooth-powder, used in connection with peroxide of hydrogen, will soon remove all accumulations of tophus on the teeth. The peroxide of hydrogen should not be exposed to the light; and the amount to be used should be poured out into a clean vessel. A small piece of cotton-wool wrapped around the end of an excavator, and saturated with the peroxide, rubbed briskly over the deposit, will sometimes act like magic.

All the deposit having been thoroughly removed, any loose teeth should be tied firmly to those that are comparatively healthy with gold wire or common binding-wire. The pockets having been syringed with peroxide of hydrogen, the application of a caustic is in order. I have found the following prescription very effective:

℞.—Hydrate chloral, ℥ i;
Spt. cochlearia, f. ℥ i.

A small piece of cotton saturated with this solution is forced down to the alveolus and allowed to remain for a few minutes. The remedy should be re-applied every three or four days until the gums are well. Carbolized potash (Robinson's Remedy) is valuable. The potash neutralizes the uric acid, and also acts as a caustic.

But it must be constantly borne in mind that none of these local applications removes the cause, and that without systemic treatment a return of the trouble may be expected.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION—TWENTY-SIXTH ANNUAL SESSION.

The twenty-sixth annual meeting of the American Dental Association convened in the Park Theatre, Niagara Falls, on Tuesday, Aug. 3, 1886, at 11 o'clock A.M., President W. C. Barrett, of Buffalo, in the chair. There was a large attendance of permanent and delegate members, and a number of important papers were read.

The first session was devoted, as usual, to routine business, among which was the consideration of amendments to the constitution offered last year. The amendment offered by Dr. T. T. Moore, changing the time of meeting to the last Tuesday in August, was laid on the table. Dr. Peirce's amendment, putting the selection of the place of meeting into the hands of the Executive Committee was, on motion of its author, indefinitely postponed; and Dr. Thompson's amendment, relative to the formation of the Sections, and permitting members to belong to more than one, was considered and laid on the table. [This amendment was taken from the table at a subsequent session and, with some verbal changes, adopted.]

First Day—*Evening Session.*

The association was called to order at 8.19 P.M.

The Sections were called, and Section VII reported, through its secretary, Dr. A. H. Thompson, Topeka, Kan., four papers, but owing to the absence of the papers reported, Section VII was passed temporarily, and Section I, Prosthetic Dentistry, Chemistry, and Metallurgy, was again called. The report was read by Dr. Wm. B. Ames, Chicago, secretary of the Section, presenting two papers, by Dr. W. H. Trueman, Philadelphia, and Dr. L. P. Haskell, Chicago, respectively, and two brief notes by Dr. W. H. Dorrance, Ann Arbor. It also commended from among the literature of the year a paper read by Dr. K. B. Davis before the Illinois State Dental Society and the report on artificial dentures given to the

Connecticut Valley Dental Association. The perfection of the small gas-furnaces offered a prospect of the more general use of carved porcelain blocks, continuous gum, and other porcelain work. A vast amount of attention, skill, and ingenuity is being devoted to the perfection of systems of crowning and bridge-work. Some of our best operators have been stimulated to meet the demand for smaller appliances to be worn in the mouth, accomplishing the desired results in a manner conducive to cleanliness and preservation. Although seemingly paradoxical, the bridge and crown-work constructed and adjusted by those who make a specialty of it is of a lower standard than work of a similar character done by those who use the system only where specially adapted. Dr. C. S. Stockton, Newark, N. J., describes a method of making bridge-work which he employs, when practicable, as follows: "Adjust the caps to the roots or teeth; take an accurate impression and articulation with the caps in place; trim the model slightly on each side of the ridge and burnish a plate of pure gold to fit it. Stamp out gold crowns with the Patrick machine and fit them accurately in place to the pure gold base-plate and to the articulation; solder the crowns to the pure gold base-plate and to the caps, thus making a piece when in place without receptacles for food and saliva and one that will remain free from *nastiness*." Dr. J. A. Swasey, Chicago, shows a method of adapting removable bridge-work or, more properly, small gold plates, in which a continuous gold band takes the place of the usual open clasp, for which he claims marked superiority over the ordinary forms. It is applicable more particularly when the supporting tooth is a wisdom tooth or second molar. It is made as follows: A band of No. 28 coin gold is accurately fitted to the supporting tooth, at the largest part of the crown itself. It will not answer to fit to a model or die, and the band must not be swaged.

Then a second band is fitted right over the first, and the two removed from the tooth together, soldered, and the edges rounded off. A narrow gold plate is then swaged up on a metal die, the band is replaced on the tooth, the plate put in position, and an impression taken (Dr. Swasey uses Modelling Composition). Then the band and plate are removed, immersed in plaster, asbestos, etc., and soldered; the bite is taken and porcelain teeth fitted and soldered to the plate. Dr. Swasey finds these appliances constructed carefully need no other support than the band gives. (See cut.) They are not cemented on, but are removable at any time. With care they can be made equally well for a number of teeth. They also work nicely where the band is fitted to an artificial crown. The report also recommended the

appointment of a time for hearing Dr. Geo. W. Melotte, Ithaca, N. Y., present his ideas on bridge-work.

Dr. Trueman's paper was entitled, "Recent Improvements in Vulcanizers and Vulcanizing," and detailed the advantages of the later methods of vulcanizing, as exemplified in the Campbell "New Mode" Heater and the Seabury Vulcanizer, over those in vogue previous to the invention of the Campbell machine. In both of these the vulcanizing oven or hot chamber is distinct from the steam generating chamber, the two compartments having a valved connection for the admission of steam into the hot chamber at the proper time. In the Campbell machine, which is also equally well adapted for molding celluloid plates, it is inclosed within the steam-chamber; in the Seabury apparatus they are separate. The principal advantages in the use of these machines are in the packing of the rubber by dry heat, and in the harder and more serviceable plate produced.

Dr. Haskell's paper, which was then read by the author, was directed more especially to the manufacturers of porcelain teeth. It was entitled, "Mineral Teeth—Needed Improvements." In it he urged that greater attention be paid to the coloring of porcelain teeth, so that they shall more closely imitate nature. He thought the main difficulty in this regard was caused by attempting to secure a degree of strength that was really not required. The next point for consideration was the need of alteration in the shapes of more or less of the teeth and in the arrangement of the pins. There was too great a tendency to multiply molds. A good share of the very small molds, and of the very large ones, might be omitted advantageously. Too large a proportion of plate teeth, both gum and plain, have "cross" pins, which should be used only when absolutely necessary, as the perpendicular position for pins is stronger. In rubber teeth there are many molds in which the pins are placed too near the cutting edge, interfering with speech. In bicuspids and molars the grinding surfaces in a majority of molds are not broad enough, and it would be better, also, if there were less difference in the length of the outer and inner cusps of these classes; and sufficient attention is not paid to the relative sizes of the six anterior teeth and the posterior teeth. What is most wanted is not cheaper, but better, teeth, and, if necessary, more should be charged for them.

At the conclusion of the reading Dr. Haskell moved the appointment of a committee of three to confer with the manufacturers upon the subject discussed in his paper. So ordered, and the president subsequently named Drs. Haskell and W. B. Ames, of Chicago, and W. H. Trueman, of Philadelphia.

Dr. W. H. Dorrance, Ann Arbor, Mich., presented a brief note upon "Vegetable Bases for Artificial Dentures," as follows:

At the meeting of 1882 a short report was made on an observation of 211 cases of patients wearing artificial dentures on vegetable bases (rubber and celluloid). The record has since been continued up to 500 cases, and it is of interest to note the following slight changes in the percentages. Leaving out of the question the probable mechanical injury from ill fitting, the number of cases in which the injury was serious is increased to 55 per cent. The number of cases apparently uninjured is increased to 9 per cent. It is also interesting that in those cases where treatment and the insertion of dentures upon metallic bases was resorted to improvement in the condition of the mouth was not only marked but radical.

In making these observations note was also made of the general condition of the patient, the cleanliness of the mouth and plate, as well as the length of time the denture was worn.

Dr. Dorrance also submitted the following "Note on a Solder Alloy:"

It should be borne in mind that it is a characteristic of many of the metals used to lower the fusing point of a solder without lowering the karat (zinc being a type) to render gold brittle. The process of formulating and compounding an alloy with which to form gold and silver solders, developed what seems to be a fact that pure zinc,—*i. e.*, free from arsenic, antimony, cadmium, etc., will not have this effect.

Take of chemically pure metals:

Silver, ...	one part;
Zinc, ...	two parts;
Copper, ...	three parts.

The copper is melted in a clean borax-lined crucible, the silver added, and then the zinc, in small portions, with constant agitation, stirring with a clay rod. When the denser fumes of the burning zinc pass off pour from a height into water or into an ingot mold. The resulting "solder alloy" may be used in the place of the metals usually employed in connection with gold and silver for gold and silver solders, which will follow and retain the color of the plate used, and be as tough and free from brittleness. The usual plan is to use from four down to two parts of either gold or silver (as gold or silver solder is desired) to one of the alloy, melting together under borax with agitation, rolling to the desired thickness and marking on one end the karat of the gold used (if gold), and also the proportion of gold as, for instance, $\frac{20}{3}=\frac{20 \text{ karats gold,}}{3 \text{ parts gold.}}$

Solders formed by the use of this alloy are easy-flowing, easily made, and as strong as the plate from which they were made.

Dr. C. N. Peirce. Dr. Dorrance did not state the nature of the injuries caused by wearing vegetable plates.

Dr. Dorrance. They were of the same nature as those previously reported. There was a generally unhealthy condition of the mucous membrane, its follicles being congested by the increased heat of the mouth, caused by the non-conductivity of the plate. One of the worst cases was the mouth of a lady who was very careful, and had only worn the vegetable plate about fourteen months. On substituting it with metal the improvement was very marked. It was his belief that the diseased condition referred to as occurring in connection with the use of artificial dentures upon vegetable bases was due, primarily, to non-conduction.

Dr. Peirce. Was there any difference between the effects of red rubber and black?

Dr. Dorrance had not noted any material difference. In the first case which attracted his attention, quite a number of years ago, the patient was wearing a red rubber plate. He substituted for this black rubber, and thought that at first there was a marked improvement; but in a little while he was satisfied there was none. On putting a metal plate in improvement in the condition of the mouth commenced soon and progressed gradually to a complete cure. This was before he began making notes of cases of this nature.

Dr. W. A. Spaulding, Minneapolis, Minn. Has Dr. Dorrance noticed any difference between the mouths of those who keep their plates clean and those who do not.

Dr. Dorrance had noticed a difference in favor of clean plates. He had seen one very severe case under a filthy silver plate; the only serious case under metal in a large number observed.

Dr. Geo. J. Friedrichs, New Orleans. If fifty per cent. of those wearing rubber and celluloid plates have sore mouths, and there are 10,000,000 of people wearing them, would not this trouble have come before us more prominently than it has? Would the wearing of these substances have been tolerated so long under such circumstances? He felt sure that if the wearing of vegetabe bases was as disastrous as Dr. Dorrance had stated the fact would have been patent to every one long since.

Dr. Louis Ottofy, Chicago. Dr. G. V. Black's investigations seem to make it clear that it makes no difference what plates are worn so that they are kept clean. Dr. Black has found the streptococcus magnus under all kinds of plates, and he believes it makes no difference what the material of the plate is. Whether or not it shall cause a sore mouth depends on the cleanliness of the patient.

Dr. Geo. H. Cushing, Chicago, thought that Dr. Ottofy had somewhat misrepresented Dr. Black's position, which is not that the condition of the mucous membrane is the same under all kinds of bases, but that this micrococcus is found under all where there is a

diseased condition. Vulcanite and celluloid afford the best hiding-place for the streptococcus magnus, because not so easily kept clean.

Dr. W. H. Morgan, Nashville, Tenn., was amazed at the character of the discussion. Not a single statement has been made that is not a rehash of what we were all familiar with, except the statistics given by Dr. Dorrance. We have once more the idea advanced that the natural heat of the mouth is destructive to the mucous membrane. It would seem that we should have had something new.

Dr. James Truman, Philadelphia. It seems fitting that we should consider the subject of bridge-work, not in a mechanical sense, but because there is a principle underlying this practice which should be clearly understood. We are in a transition state. Where mechanical skill seemed to be almost a lost art we are going back to cultivate its highest forms. We have been shown crowns and pieces of bridge-work which are indeed works of art. But it is a question whether we are not going too far and too fast in this direction. Do the gentlemen who so enthusiastically commend this style of work clearly comprehend the effect of a tightly-fitting band upon a tooth? The speaker had seen a gentleman go at the work of driving a band home on the delicate tissue which surrounds the tooth as though he were working upon a mandrel. If it is not possible to place a rubber band upon the pericementum without risk of serious trouble, will it stand the constant pressure of a rigid, unyielding band? We ought to know that it will almost certainly result in permanent injury.

Dr. W. H. Atkinson, New York. It is well when we make a statement of facts that we know they are facts. The gentleman says that pericementum is a delicate tissue. If there is a tissue that will bear almost unlimited abuse, it is the pericementum. The difficulty is want of knowledge as to how much tissue has been lost at the end of the root; whether it will bear the strain which will be put upon it by such operations. But the fact that where there is not enough of the root left the work fails does not militate against the correctness of the principle. So far as the speaker knows, bridge-work in intelligent hands is the *ne plus ultra* of dental practice.

Adjourned till Wednesday morning at 9 o'clock.

Second Day—*Morning Session.*

The association convened, pursuant to adjournment, President Barrett in the chair.

Dr. Wilhelm Herbst, of Bremen, Germany, was introduced to the association by Dr. Bödecker, and was welcomed by the president as a representative of German dentistry. On motion of Dr. Atkinson, Dr. Herbst was unanimously elected an honorary member of the asso-

ciation. A vote of thanks was also given to Dr. Bödecker for his efforts to secure the visit of Dr. Herbst to this country.

The privileges of the floor were extended to Dr. Lyman C. Bryan, of Switzerland, and to a number of visiting dentists from Canada.

The discussion of Section I was then resumed.

Dr. W. P. Horton, Cleveland, thought Dr. Morgan was wrong when he maintained that the heat under a plate in the mouth was only the normal animal heat. It was more than that; it was superheat,—inflammation. The ill effects of vegetable bases were not due to the toxic influence of the material used to color the plate, but to the nature of the thing itself. The friction of mastication produces heat, which is retained and irritates the parts until it results in inflammation, causing the diseased condition referred to.

Dr. John Allen, New York. One point has not been touched upon in the discussion, and that is the use of mercury as a coloring-matter for vegetable bases. Whether his information was correct he could not say, for he never made or caused to be made a rubber set. If there is mercury in the compound it may be a question whether the soreness is not due to it. It is stated that red rubber consists of sixty parts of sulphur and mercury to forty parts of rubber. That being the case we have sore mouths. His experience has been that when patients with sore mouths from rubber plates are supplied with metal plates the mouths get well and the ptyalism or other trouble disappears. In view of the facts he thought it an open question as to whether the soreness was not due to the mercury and sulphur rather than to the plate being a non-conductor.

Dr. N. W. Kingsley, New York. There is such a thing as using rubber that has no mercury in it. Black vulcanite is pure rubber and sulphur. The speaker has seen cases of sore mouths under rubber plates where there was no mercury. He believed the sulphur and rubber were absolutely harmless. But he has seen many miserable specimens of plates. Not one in a hundred is properly finished on the surface which is to come in contact with the mucous membrane, but they are turned over to the patient just as they come from the plaster—just in the condition to retain all the filth and nastiness that can accumulate. You can't keep such plates clean. There will always be plenty for the micrococci to feed on under the surface of such a plate. He believed that a vulcanite plate with no coloring-matter (and he did not know that mercury was deleterious), and with its surface made clean and smooth, could be kept clean if the patient would do it. The trouble is that patients lose their enthusiasm after a little while and don't keep their plates clean. If they could be kept clean he believed vulcanite plates would be no more injurious than any others. Now, why do dentists leave the *thing* in

the condition described? Generally, it is because they receive only small pay for the work; another reason is because when the plate is rough they think they get a better adhesion to the gum.

Dr. C. H. Land, Detroit. There is one simple way of answering the whole question. If the patient will take an ordinary tooth-brush and brush the plate thoroughly twice a day it will be kept clean and there will be no trouble. Friction and cleanliness are the remedy. Remove a denture from a sore mouth and allow it to remain out for four days and the soreness will be cured, generally. The friction of the food alone will accomplish the cure.

A supplemental report was subsequently made by Section I "to make prominent mention of the processes and appliances of Dr. J. Rollo Knapp, of New Orleans. . . . Instead of stereotyped results in which there can be little individuality or taste displayed his methods produce by simple yet exact stages porcelain-faced or all-gold crowns that will admit of very little criticism, if the processes which he advocates are imitated by the skillful and careful manipulator. His very unique and original blow-pipe, with which he utilizes compressed nitrous oxide with illuminating-gas to produce what is practically an oxyhydrogen flame promises to be one of the most useful appliances ever offered for dental laboratory use."

Dr. N. W. Kingsley, New York, said that Dr. Knapp had done some of the most wonderful things he had ever seen in the practice of dentistry. As he sat yesterday and saw how magnificently Dr. Knapp's methods produced results which he himself had done over and over again at a much greater expenditure of time and effort, he could not but reflect that he was witnessing work so far in advance of what had been done before that it was almost pitiful to think of the time wasted. Dr. Knapp has invented a system that will almost revolutionize that branch of dentistry which so many practitioners affect to ignore because it is "mechanical." Filling a tooth is mechanical treatment of caries and you can't make anything else out of it. Here, however, is a branch of mechanics developed to a degree of perfection never attained before. No means ever before known would have enabled us to attain such results. The invention of the means for the combination of nitrous oxide and illuminating-gas for a blow-pipe flame and the discovery of the results which it will produce is something marvellous. It had especially pleased the speaker, as it would any man, to find his own pet methods carried to such perfection. He referred more particularly to the manner of making gold crowns and the combination of a porcelain face with a gold crown. Some have advertised gold crowns already made; gold bands already made; and described methods intended to facilitate the insertion of these substitutes. The speaker has maintained that no gold crown

stamped up to a fixed form can reach the highest perfection of adaptation. In accord with this view, Dr. Knapp has a large number,—some two hundred and seventy-odd copies of grinding surfaces, which he collected in the hope that they would be useful to him, but which he finds of no value. They don't fit, and they are of no use. If you are going to make a gold crown adapted to a root you want to so make it that you can see if it is adapted properly. Then you can detect any inaccuracies, and no matter what steps have been taken to that point you have it in your power to correct the adaptation. Dr. Knapp's process, to the point of attaching the cap to the band, is identical with the plan pursued by the speaker for years. You build up your artificial crown in wax, or as you please. Then with the most simple method he had ever seen Dr. Knapp produces a metallic die upon which you can swage up all the peculiarities required. It is not difficult to bring the crown into contact with the band already fitted. The compound blow-pipe spoken of in the report does it more beautifully than any other method he had ever seen.

Dr. Frank Abbott, New York, had examined Dr. Knapp's specimens, and had seen the working of his wonderful blow-pipe and he was certainly astonished and delighted. The blow-pipe could be used wherever you could find illuminating gas. The whole thing was so astonishing that he was completely carried away.

The subject was passed.

(To be continued.)

The annual election was held on Friday, August 6, 1886, and resulted as follows:

W. W. Allport, Chicago, president; Geo. W. McElhaney, of Columbus, Ga., first vice-president; S. W. Dennis, of San Francisco, second vice-president; Geo. H. Cushing, of Chicago, recording secretary; A. W. Harlan of Chicago, corresponding secretary; Geo. W. Keely, of Oxford, Ohio, treasurer; W. C. Wardlaw, of Augusta, Ga.; S. G. Perry, of New York City; and S. H. Guilford, of Philadelphia, members of executive committee; also, to fill vacancies in the executive committee, E. T. Darby, of Philadelphia, and A. W. Harlan, of Chicago.

Asheville, N. C., was selected as the place for the next meeting of the association, and a resolution was adopted inviting the Southern Dental Association to meet with it.

The newly-elected president appointed as members of the publication committee Drs. E. T. Darby and A. W. Harlan; and as local committee of arrangements, Drs. T. T. Moore, Columbia, S. C.; M. A. Bland, of Charlotte, N. C., and B. H. Douglass, of Asheville, N. C.

SOUTHERN DENTAL ASSOCIATION.

The eighteenth annual convention of the Southern Dental Association was held in the hall of Watkins Institute, Nashville, Tenn., commencing Tuesday, July 27, 1886.

First Day—*Morning Session.*

The association was called to order at 10.30 A.M., by the president, Dr. W. C. Wardlaw, of Augusta, Ga.

After the opening exercises, consisting of prayer by the Rev. Dr. J. D. Barbee, of Nashville, and an address of welcome by Dr. J. H. Prewitt, representing the Tennessee Dental Association, responded to by Dr. Geo. H. Winkler, of Augusta, Ga., on behalf of the Southern Association, the president, Dr. Wardlaw, in lieu of an annual address, read a paper entitled "Is Dentistry a Profession?"

The following is a synopsis of Dr. Wardlaw's paper:

Our claim is that while dentistry is a distinctly organized profession, made so by peculiar circumstances, it is properly and really a specialty of medicine, being at the same time a science as well as an art. The medical fraternity generally are disposed to regard dentistry as one of the arts, with a slight admixture of medicine. Medicine, in the present acceptation of the term, is very comprehensive, and signifies all that pertains to the prevention, alleviation, and cure of disease, being conveniently divided into surgery and medicine. The ancients did not recognize a distinction between the two, but included both in the healing art. We, however, mark the essential points of difference by limiting surgery to the concern of local injuries and disorders, and restricting medicine to those affections which involve the general system. General surgery is arbitrarily subdivided, according to the particular parts or organs to be treated, into ophthalmic surgery, obstetric surgery, laryngeal surgery, oral surgery, etc. Dentistry being almost synonymous with oral surgery would thus seem to be a special part of medicine. But not having been taught by medical colleges, in fact rather repudiated by them, how has it been evolved as a specialty of medicine?

The vast and ever-increasing domain of medicine would seem to preclude the possibility of the whole being properly cultivated by one mind. Necessity and convenience have, therefore, divided and subdivided it into various branches and departments. Long before the accruing knowledge of modern times recognized this necessity, the ancients found it expedient to do the same thing, for Herodotus tells us that in Egypt, "the mother of the arts and sciences," so wisely was medicine managed that the physician applied himself to one disease or locality only—" some to the eyes, others to the head,

others to the teeth." Subsequently, and elsewhere, however, the practitioner was expected, as before stated, to combine in himself all attainable knowledge of the healing art, until, in later times, the discovery of new truths, and the development of new principles and practice, carried the art far beyond the capacity of one intellect to grasp it entire. Hence arose the modern specialists of the eye, the ear, the thoracic cavity, the urinary organs, etc., and why not the specialist of the mouth and teeth?

General surgery is art, high art, utilizing numerous mechanical instruments and appliances, and requiring dexterous skill, an educated eye, and a just perception of the beautiful. These elements are equally essential in dentistry; but the difference, which seems to make the distinction, is that dentistry has not been acquired in a medical school as surgery has been. Dentistry is not covered by a medical diploma, and to that extent cannot be, technically, a specialty of medicine. A diploma is a mere certificate of proficiency.

The essayist himself had studied medicine in dentistry because he could not study dentistry in medicine. It is well remembered by the older practitioners how Dr. Chapin A. Harris and his coadjutors made overtures to the medical colleges to have dental professorships incorporated in the faculties; how these propositions were scornfully rejected; how, in consequence, the Baltimore Dental College, the first of its kind ever founded, was obliged to struggle for early existence. It was thus that dentistry came to be taught in separate schools. The dental schools are, however, mere duplicates of the medical schools in anatomy, physiology, pathology, chemistry, materia medica, etc., and the dental student may acquire these branches as well in one as in the other. The essayist's own judgment leads him to believe that pure dentistry will be better taught in dental colleges. Year by year, as our standard of qualification is raised, men of character and education are joining our ranks, and are obtaining recognition from physicians as professional equals. Let every dentist feel that upon him individually rests the responsibility to uphold the honor and maintain the dignity of our profession; then there will be no need of cringing and fawning to secure that honorable recognition to which we are entitled.

Dental Education was taken up, and Dr. B. H. Catching, of Atlanta, Ga., first vice-president of the association, read a paper, of which the following is an abstract:

Dentistry as an art has made wonderful progress, but as a branch of medical science it has advanced very slowly. The establishment of separate schools for teaching dentistry, and creating a separate degree for it, were original mistakes which have retarded our advancement in medicine. When we were denied the privileges of medical colleges we should have established schools of medicine for

teaching the whole course, with the degree of doctor of medicine. It is true that we have attained to some distinction, by persistent labor at great disadvantage; but this distinction was not acquired through those who depended on our schools alone, but is due to advantages obtained in schools where medicine as a whole is taught. For fifty years we have been endeavoring to persuade the world to believe that we were specialists in medicine. It is not remarkable that the world has been slow to believe it. It is unreasonable on our part to expect such a thing when we neither teach nor graduate in medicine, but continue to work under a curriculum of our own in which medicine has a very small part. The essayist did not wish to be understood as striving for medical recognition. That would be laudable, he admitted, but he desired to see dentistry placed on a plane where it will command the highest respect of the people, and have accorded to it its full sphere of usefulness. It is commonly believed by not only a large majority of the people, but the speaker was sorry to say by a vast number of dentists, that the only qualifications necessary for becoming a dentist are a mechanical turn of mind and the education necessary to develop and train such a mind. Our separate schools and degree have forced this idea on the people. To correct it we must change our system. If we wish to be a part of medicine and surgery we must accept the teaching necessary to qualify us for it. We must be educated in regular medical schools, and graduate under one common degree. How can we claim to be practicing a science so high, so broad, and so grand, of which we hardly know the first principles? When universities established dental departments it was thought that every requirement had been met; and when conducted in connection with the medical departments, they certainly are an advance toward better medical teaching. But when these dental departments are conducted apart from the others, they are mere dental schools. Dr. Catching's idea is to do away with dental colleges; do away with the university dental departments; do away with the degree of D.D.S.; return to reputable medical colleges, and come forth as doctors of medicine; then enter a dental infirmary in which the highest type of practical dentistry is taught. This done we shall stand fully equipped to practice dentistry as a specialty of medicine.

Adjourned to 2.30 P.M.

Afternoon Session.

The subject of Dental Education was opened for discussion.

Dr. J. J. R. Patrick, Belleville, Ill., though the subject of dental education was like the harp of a thousand strings; the more you play on it the more music you have. The best way to approach the question as to whether or not dentistry should be considered a

specialty of medicine, is to take a retrospective view of medicine itself, in order to know what has been done. For many centuries not a single step was made in medical knowledge. The works of physicians from the beginning of the Christian era to the fourteenth century were mere compilations from the few works previously existing. What the ancients knew of medicine was what any old woman at a cross-roads knew. John Hunter was the first to describe the fetal circulation; the first to describe the human jaw and teeth. Physiology was a mere theory until he made it a science. Yet he was not a surgeon nor an M.D.

Dr. W. H. Morgan, Nashville, Tenn., said that dental education in this country had had a progressive history since 1836, when the first dental society was organized. Up to that time our only source of information was in the few text-books or treatises that existed. That society of dental surgeons discussed the necessity and propriety of establishing a school for teaching dentistry. Naturally it was sought to connect it with a medical college, but it was refused recognition. Dentistry was, however, even then, able to take care of itself, and the speaker suspected is able to do so to-day. The Baltimore College was organized with but four chairs,—the chairs of chemistry and anatomy were added a few years later. When the speaker was a student there he thinks there were not more than one hundred and thirty men in the United States who could make a gold filling. American dentistry leads the world through her colleges, and it all arose from these small beginnings, independently of medicine. He would not like to rely on any medical college for a dental education. Let the dentist come from the dental school; the doctor from the medical school.

Dr. Catching. No one disputes that American practice leads the world in dentistry, yet no one is willing to claim that he can get a medical education at a dental college sufficient to practice medicine. The lines are too closely drawn. For instance, a student at one of our dental colleges who proposed to reach up into the antrum of Highmore was informed that it was out of his field. Dr. Morgan deserves great credit for his achievements against adverse circumstances, but it is a significant fact that he has educated his own son first as an M.D. and then as a dentist. Dr. Morgan, he fears, speaks now as the representative and dean of a dental college. If we wish to stand as high as doctors of medicine we must study medicine. It is only a question of a few years. Our narrow basis of education keeps many foreign students away. They have learned much of our practice from American dentists abroad, especially in Germany, where, as a return, the laws are now so stringent as to almost deny recognition and education to Americans.

Dr. Morgan insisted that he had worked as hard and as long as any one to broaden the basis of dental education. It could not be too broad for him. He doubted the statements made as to foreign students remaining away. He believed the best dentists abroad had been educated in this country. The leading man in dentistry at the Berlin University was Dr. Miller.

Dr. A. O. Salomon, New Orleans, La., thought there were too many new colleges, the result being rather to grasp after students than to educate them. In Germany, no matter what diplomas he may have obtained elsewhere, a student must stand a rigid examination before he can even enter the universities. That is the reason that German dentistry stands high. In this country we need either enlarged medical education, or a combination of medical and dental schools. American dentistry has suffered in Germany by the office boys of German dentists coming here for a year or two, and returning to parade as American dentists.

Dr. B. H. Teague, Aiken, S. C. There is no doubt that some graduates of American dental colleges have brought reproach upon us in foreign countries. Germany probably felt constrained to protect her people from imposition. Mischief has been done by preceptors and professors themselves in loosely giving certificates, or allowing the use of the infirmary in summer in lieu of private tuition. If we would require dental students to be educated men, let the faculties see to it.

Dr. H. J. McKellops, St. Louis, Mo., said that he had never graduated, but was a self-made dentist, and he believes there are many more like him in that respect. And yet we all feel the want of better education. He never sees a class of students without exclaiming, "Oh! if I had had the advantages these young men have." He believes the colleges are doing all they can to broaden their teaching, and that dentistry is bound to be a separate profession. He does not think it a part of medicine. Let every dentist put his shoulder to the wheel and encourage all the colleges.

Dr. G. F. S. Wright, Columbia, S. C., asked Dr. McKellops whether he thought dentistry should be taught and practiced in two branches,—the operative and the mechanical.

Dr. McKellops saw no good reason for subdividing dentistry.

Dr. W. W. H. Thackston, Farmville, Va., said that he had been associated for many years with efforts to promote dental education. Having been turned away in the beginning and left to our own resources, we have accomplished a great work. A system that has achieved so much, that has produced so many noble practitioners, should not be hastily abandoned. The profession is now abundantly able to take care of itself, to broaden its foundations, and extend

its honor and usfulness. As an M.D. he had sought and accepted his diploma only with the view to adapt himself more perfectly to his specialty of dentistry. He is not inimical to medical colleges, but believes that dentistry will lose infinitely by abandoning the established system, and seeking to merge itself in the larger profession. No system yet devised can supply heads with brains. Our profession does not contain all the noodles.

Dr. G. F. S. Wright stated that during the last twenty years many of the States had done good work in dental legislation, but unfortunately the laws cannot touch an offender for having done that which was not an offense before the acts were passed. In Georgia, he was glad to say, no matter if one went there with a pocket full of diplomas, he could not practice without passing a rigid examination.

Dr. James Johnston, Staunton, Va., was glad to hear Dr. Wright's statement. Virginia has also made a law which will enable us to control dentistry in that State, although there are many charlatans that we cannot reach. He is of the opinion, as regards dental education, that there are too many dental colleges, and that what is wanted is a dental university, with endowed professorships.

Dr. J. Y. Crawford, Nashville, Tenn., said that the dental profession was numerically weaker than any other, yet it is receiving accessions from all the other professions. The proportion of educated men in the dental profession is very large. He believes that the idea that the dentist must be an M.D. has "come to stay." The dentist as an M.D. would be preëminently a doctor of medicine.

Adjourned to 10 A.M. July 28.

(To be continued.

The election for officers of the association for the ensuing year was held on Friday afternoon, July 30th, and resulted as follows: W. W. H. Thackston, Farmville, Va., president; B. H. Catching, Atlanta, Ga., first vice-president; J. Rollo Knapp, New Orleans, La., second vice-president; W. H. Richards, Knoxville, Tenn., third vice-president; J. Y. Crawford, Nashville, Tenn., corresponding secretary; Louis P. Dotterer, Charleston, S. C., recording secretary; H. A. Lowrance, Athens, Ga., treasurer; J. Hall Moore, Richmond, Va., E. S. Chisholm, Tuscaloosa, Ala., J. A. Woodley, Norfolk, Va., executive committee.

The time fixed for the next annual convention was the first Tuesday in August, 1887, and the place Old Point Comfort, Va., discretion being allowed the president and executive committee to change the place to some other in the same vicinity on the coast of Virginia.

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular meeting, Tuesday evening, May 11, 1886, in the parlors of the New York Academy of Medicine, No. 12 West Thirty-first street.

The president, Dr. E. A. Bogue, in the chair.

Dr. C. F. Ives. Mr. President, I would say to those who are using iodoform that they will find an efficient substitute in a new preparation termed "iodol." It is said to be prepared from pyrrol, obtained from animal oil, precipitated with a solution of iodide of potassium, containing iodine. The great advantages claimed for it are that it contains ninety per cent. of iodine, and is entirely free from the disagreeable and persistent odor of iodoform. An ethereal solution, with a little absolute alcohol to prevent too rapid evaporation, is an excellent antiseptic in the treatment of blind abscesses, and for immediate application following the opening into a pulpless tooth. If those who use gutta-percha for filling root-canals will add a little iodol to their solution they will find it valuable.

The President. Dr. Meriam, of Salem, Mass., is with us this evening, and, having given considerable attention to the subject of crowns, has consented to exhibit some new forms which he has devised. I take pleasure in introducing Dr. Meriam to the society.

Dr. Horatio C. Meriam read a paper on "New Forms of Artificial Crowns." [See the Dental Cosmos for August, page 493.]

The President. We are greatly obliged to Dr. Meriam for the the paper with which he has favored us. If Dr. Allan will be kind enough to present to the society his addition to the paper which he read at our last meeting, we will then hear the comments of the gentlemen who are anxious to discuss the subject.

Dr. Geo. S. Allan. In my hastily-presented remarks upon caries, at the last meeting of the society, I omitted a few points which I am pleased to have the opportunity of referring to at this time.

It is my wish to emphasize the views of Dr. W. D. Miller, of Berlin, concerning bacteria, and I hope that this society will give voice to the common favorable judgment upon the writings of that gentleman, and show its appreciation of his painstaking efforts. The bacteria theory, as presented by Dr. Miller, seems to me to be very complete, accounting as it does for the origin of nearly all the acids which produce caries, and demonstrating that most of them are the direct result of fermentation. There is a sequence or extension of Dr. Miller's theory that I consider worthy of more than a passing notice. It has been demonstrated that this bacterium of fermentation

is not only specific in character, but is capable of growth and reproduction, though entirely excluded from moisture or oxygen. Here seems to be an explanation of some of our failures. Most of you, I think, will say that it is not an uncommon experience, when for any cause you have found it necessary to remove a filling, to find the floor of the cavity soft and more broken down by caries than you had expected,—more especially in cases where from proximity to the pulp some semi-decalcified dentos had been left as a protection. I can recall several instances where, on removing the filling, I have found a fully-exposed pulp where it had not been exposed at the time the filling was inserted ; the evidence being almost conclusive that decay had gone on after the insertion of the filling. Such cases have puzzled me not a little at the time, but now they seem more clear and easy of explanation, for we have a well-proved theory that accounts for the acid under the filling. This theory gives an explanation of another curious fact,—one which we have doubtless many times asked ourselves the meaning of,—viz., why does caries manifest itself in the formation of well-defined cavities in the tooth-substance? If the acids producing caries were diffused in the fluids of the oral cavity, the tooth would be equally dissolved as would a piece of marble in an acid solution. Now we can see how it is that the acid of caries locates itself in spots, and a cavity once started becomes a manufactory of acids, which determines the character and shape of the carious part of the tooth. I called your attention at the last meeting to the fact that we often found a rough surface at the neck of the tooth where the cementum seldom overlaps the enamel as it should, and that this unevenness was the cause of decay and recession of the gums. One important point which I did not notice is one of the reasons for my claim that the little septum of enamel above large approximal cavities in bicuspids and molars should be either entirely cut away before the filling is in serted or beveled off at quite an angle from the margin of the cavity. In this enamel there is almost always a crack or check which can be plainly seen after the application of the rubber, the check coming at the point where the opposite portions of the enamel join but imperfectly in their development. The beveling or cutting away of this enamel should be done with a sharp, round bur, revolved rapidly in the engine, as a clean cut cannot be made with a chisel. If the enamel referred to is allowed to remain, it will very likely be broken or injured by the force used in packing the filling against it.

While speaking of enamel it may be well to state that Dr. Sudduth's experiments prove that the cement between the prisms is almost entirely of calcareous origin. After making a section of the enamel, he places it first in chromic acid, which is a most powerful

solvent of calcareous matter, and the interprismatic structure is dissolved out, leaving the prisms. By using hydrochloric acid, which is not so active an acid in its action on calcareous substances, the enamel breaks down more evenly. In shaping cavities for plastic fillings it is not necessary to cut out as much as when gold is to be used. Slight undercuts or roughness of the walls are amply sufficient to hold plastic fillings, such as oxyphosphate and amalgam, and you save cutting off the dentinal tubules, thereby preserving more of the life of the tooth. The dentinal tubules at the point where they are cut off are smaller in diameter than where they join the pulp. Pressing on the smaller end of the tubules with a plastic material capable of entering them, you necessarily press their semi-fluid contents toward the pulp-chamber. Once having your attention drawn to this danger, I think you will all see how to guard against it.

The President. The discussion of Dr. Allan's paper on "Dental Caries," read at our April meeting, is now in order. We will have the pleasure of listening first to Dr. Hodson.

Discussion.

Dr. J. F. P. Hodson. I wish to express my thanks to Dr. Allan for his excellent paper, and particularly for the many practical points which it contained. Some things in it, however, I do not quite agree with, and of those I will speak more especially.

The separation of the enamel from the dentine referred to I regard as a theoretical rather than a practical point, and I am inclined to believe that Dr. Allan did not stop to think that the microscopic specimen is a mere section, and therefore very easily broken. Would the whole cervical periphery of a tooth do the same thing in cavities as we see them? There is much strength in the cervical edge of the enamel beyond what the mere sectional strength would be. The enamel covers the whole approximal surface of the tooth, while the cavity seldom does, and the unbroken continuity of these remaining sides with that at the cervical margin undoubtedly adds largely to the latter's strength. Moreover, if the hold for the stopping is, as it should be, in the *dentine* at such cervical margin, and not at the junction of dentine and enamel, where its proper filling would pretty certainly pry the enamel off, the strength of this underlying dentine tends further to uphold the integrity of the enamel. Dr. Allan considers the two substances absolutely separate and distinct, in his antagonism of the theory of the reticulum permeating the whole. Reticulum or no reticulum, I do not quite see how they can be so absolutely separate as he suggests, when we know so well that the den-

tinal fibrils frequently enter the enamel. It is not an uncommon thing to see that under the microscope. The enamel is a hard and friable substance; the dentine is, on the contrary, a strong, tough, unfriable substance. One separates from the other in the preparation of the specimen, as a natural consequence of their difference in texture. I cannot see that it is because they are separate and distinct substances in the sense in which Dr. Allan presented the point to us. I entirely agree with Dr. Allan as to the beveling of the enamel at the cervical margin, for I do not think it feasible to make a proper stopping when overhanging or sharp edges of enamel remain.

In regard to what Dr. Allan urges about undercuts being made so as not to cut off the tubuli, while that is an excellent theory, it smacks more of the library than the "drawing-room." We must make cavities as we must; we cannot always make them as we would. The dentine is not absolutely dead in consequence of being undercut and its *direct* communication with the pulp severed. Even if there be no anastomosis of the dentinal fibrillæ near the pulp, there certainly is throughout the body of the tooth, and the dentine referred to is supplied with some nutrition. This point seems to be overdrawn and overrated, and I do not feel that there is any such danger in it as Dr. Allan would lead us to suppose. Dr. Allan refers to the longitudinal concavity on the approximal surfaces of the teeth as a dangerous place because difficult to clean, and suggests cutting away the approximal surface from its center inward toward the tongue, in order that a straight face may be made in place of the groove or depression. Above all things, I antagonize that. In the first place, I do not think that the depression is a dangerous point at all. I do not think any one in this room has ever seen decay *commence* there, though decay may include it in its progress. We know very well that the inherent strength of the root of the tooth is itself a resistance to decay, and if covered with cementum absolute proof against it. Moreover, the remedy, supposing the decay did commence there, would be so much worse than the disease that I should not discuss the propriety of applying it myself. I would rather have the cavity come, if it must, and fill it. Of all things dental, that which seems to me to be most monstrous is this idea of whittling away the sides of the teeth, in contradistinction to restoring their contour for the protection of the gums, and preserving the whole of the grinding surface to subserve all the uses which the teeth were made to subserve. I had the misfortune to practice this "shaping of teeth" at one time, and I think I am more sorry about what I did then than about any other of the wicked things I have done in all my professional life. I was very careful to get ideal teeth, and ideal patients, and to make the ideal cuttings, and I found that eventually I produced

ideal cavities also. I feel so strongly on the subject that it seems to me, from my point of view, that it is not discussable practice.

In conclusion, I wish to refer to Dr. Allan's interpretation and application of Dr. Miller's discoveries concerning the activity of bacteria under a filling. Dr. Allan has claimed that these "bugs," as our erudite friend, Dr. Clowes, calls them, being prime factors in the decaying process, could do their perfect work without oxygen or moisture under a perfect stopping. I am little conversant with the theory other than as I have seen it printed, but practically I do not at all agree with the proposition that decay will go on underneath a filling if that filling be a perfect one and the tooth has been placed in proper condition to receive it. When I say underneath, I mean literally *that*, and not the sides or margins of cavities, of course. Decay has been left in the bottom of cavities by our wisest operators where its removal would have exposed the pulp, and time has proved it to be a wise and safe plan. Many times such structure has been found recalcified after having been properly protected for a long time. We often see that obtain under amalgam fillings; but whether that were true or not, I think that, on the general principle of Dr. Atkinson's wanting a friend in the cavity, we most of us are in the habit of lining the cavity with something in every case. I use carbolic acid in all cavities, large or small, and supposing that decay *could* go on underneath a perfect stopping, I am of the opinion that carbolic acid would prove a sure preventive of such action. Carbolic acid has, too, a large influence in reducing all after-shocks to the pulp of the tooth in consequence of the transmission of heat and cold through the filling, by coagulating the albuminous contents of the tubuli for a little distance, and so making a non-conducting lining to the inside of the cavity. Carbolic acid also shows decay perfectly, making it visible where it was not before the application. Altogether this lining of the cavity with carbolic acid produces such good results that I should certainly feel lost without it. I depend upon it a great deal for these many good reasons, and use it in every cavity. Through all these years I may have been "building better than I knew" in regard to the "bugs." I am glad to have heard the paper, and I personally thank Dr. Allan for the valuable little points of practice contained in it that every one of us is so glad to get.

Dr. S. G. Perry. I consider Dr. Miller's explanation of caries the most satisfactory of any that we have had. Certainly I have been led to believe that bacteria may be considered as important factors in the production of decay, but I cannot say that from the standpoint of my observation I am ready to agree that decay will go on under a perfect stopping. Millions of fillings have been put in since dentistry has become a science, and if we know anything we know

that decay is stopped by perfect fillings, and that it is not stopped by imperfect fillings. When we see decay going on under a filling, careful examination will discover a defect in the filling, or a tooth so poor that a good filling does not make a perfect joint. I have supposed that decay could be arrested by making an accurate margin and a good joint, even if a portion of the decay were left in the cavity. Dr. Dwinelle demonstrated that many years ago. I think we all must have seen cases where, when fillings have been removed, after some years the decayed dentine in the bottom of the cavity has shown a condition of recalcification. The age of the patient has much to do with it. We ought not to cut out the softened dentine in the teeth of young persons, but we might do it for middle-aged persons. In the shaping of cavities I certainly make an effort not to cut off the tubuli if I can avoid it; but at the same time it seems to me that it is not of such importance as Dr. Allan considers it, because there may be a little anastomosis taking place at the margin of the enamel, by which the fibrils beyond the line where the cut has been made will receive some nutrition.

There comes up again the same question of saving teeth by accurate filling. We see thousands of cases where dead teeth are saved for life if they are well filled. As Dr. Hodson says, it is hard in actual practice to make cavities as we would like to have them.

I think Dr. Allan has given us a very timely paper, especially for young men, and I am delighted that he has brought this matter to our attention. The only criticism I would make would be in reference to cutting away portions of the teeth. It is my firm conviction that there is to-day no sin so great in dental practice as that of disturbing in any way the natural shape of the teeth. I think the time has gone by when that should be allowed. Rather than cut the approximal surfaces, I would let them decay, and then fill the cavities resulting, so that their natural shape shall be preserved and the teeth prevented from moving in their sockets. You cannot take off a shaving from any one of them without changing more or less the location of the rest. As a rule of practice to be accepted as a doctrine by young men, and to be put in practice on general principles, I think the strict form and shape of the teeth should be considered of paramount importance. The good that comes from cutting may seem to be a clear gain at first; sometimes it is so at first, but the evil comes later. If the decay commences at the gum—as it is liable to do when the teeth have been cut apart and have settled together again—the task of stopping it is no longer one to be easily performed. It seems to me that I ought to enter a mild protest against the universal habit of cutting off all the enamel near the root on the approximal surface. If you can leave that little portion

of enamel there, and with hand-pressure can carefully fill the upper quarter or third of the cavity with soft gold, and the rest of the cavity with cohesive gold, you can finish your fillings in such a way that when the teeth come together again you will have an absolutely perfect condition of the gum at that point. This is something worth taking into account. It is a very nice thing to restore the tooth at that point and have the gum retain its normal condition. I think we have seen enough to-night to convince us that the filling of small cavities is correct practice. You know our president has exhorted us for years to do our duty in this direction. We are responsible for the proper condition of the teeth of our patients, particularly of children, and I am quite certain that the majority of us are not as careful as we should be in regard to the filling of small cavities. Dr. Allan has shown you how decay will go beyond our reach. Recently when I passed an examining probe into the fissure of a tooth I was doubtful whether there was a cavity there. My *first* impression was that there was no decay, and yet I found that the pulp was actually exposed.

Dr. E. H. Raymond. I would like to emphasize what Dr. Perry has said in regard to filling small cavities. By doing so we not only hold in reserve the vital force necessary to prolong our dental usefulness, which is expended largely in large operations, but we save this to our patients as well, and much valuable *living tissue*, which is better than anything we can put in its place. When we do find large cavities it is wise to saturate them thoroughly with carbolic acid after excavating, as Dr. Hodson suggests. There is no agent, to my mind, so potent and useful. It changes the character of softened dentine, "embalming" the organic tissue, and counteracting the effect of any solvent acid that may be present in the cavity. If bacteria are there at work, this agent will change their character also, unless indeed they are iron-clad bugs. How any form of organized life can exist in a bath of pure carbolic acid I fail to understand, and I do not believe that bacteria can live and work in this agent under fillings or otherwise.

Dr. John B. Rich. I think some of the remarks made this evening are unwise. No person should criticise the theories based upon investigations of scientific men unless they have a thorough knowledge of the matter they attempt to criticise. Without such knowledge any criticisms upon the theories presented by Dr. Miller are very much out of place, and may at some future time be productive of great mortification to those who make them. Investigations into the phenomena surrounding the origin, nature, development, and office of bacteria have engaged the attention of a large number of scientists for a long time, and the interest excited by the results of

such investigations is increasing every day. The facts already established in relation to bacteria will alter many of the heretofore accepted theories in relation to certain processes and conditions of development, and will enable us to account for many things concerning caries that we have heretofore been in the dark about. Investigation in the direction suggested by the experiments of Dr. Miller might enable us to arrive at a positive knowledge of the causes of decay, which it is so important we should have when we attempt to prevent it. I have known decay to occur under many a filling that was put in with all the skill and judgment I possessed, and where I thought the tooth-structure was good and healthy. I then attributed the presence of decay under the filling to defective organic structure, and this may have been the reason in many cases. But with the knowledge I now have I might find other causes besides the defects in the structure.

Perfect fillings introduced into perfect dental structures will usually save them, the failures being rare. A large proportion of the teeth I fill are preserved by the fillings, but there are exceptions to this rule, and I have often met with teeth that I could not save, although I have re-filled them several times, taking every precaution possible to prevent bacteria remaining under the fillings.

Dr. Hodson. I do not think that any of the gentlemen who have spoken to-night have been antagonistic to Dr. Miller's theories, as Dr. Rich seems to think. On the contrary, Dr. Miller's theories have been praised, and only Dr. Allan's interpretation of them criticised.

Dr. Geo. S. Allan. Success in saving carious teeth depends on the careful attention given to details. Many small dangers make a great danger. Therefore, we should aim to avoid as many of the former as possible. In making a common whole of a carious tooth and a filling-material, we should take into consideration that the former is a composite structure, varying chemically, morphologically, and in vitality. Fatal to success is the too common practice of treating it as we would a structureless piece of ivory, and depending on mechanical knowledge and dexterity only.

A minor point alluded to in my remarks has been made a major one with a vengeance. From beginning to end of my paper I advocated saving all the healthy tooth-structure possible in every case. My friends who are contourists, if I may use the expression, make me an advocate and exponent of wide separations and a destroyer of tooth-substance and symmetry. My *a* method of practice was made *my* method of practice. This was a mistake. I do believe in restoring the shape and perfect form of a tooth wherever practical and advisable; but I do not believe in pushing esthetical dentistry to the front and keeping practical dentistry in the rear. I believe

in saving my teeth first, and looking to beauty of form, shape, and finish afterwards. I am not an advocate of "re-filling" where it can be avoided. With the advent of cohesive gold came as a sequence many wild views of restoring shape, and our best operators went wild over what they could do in that way. I am convinced that I echo the belief of the calm second judgment of those same most excellent leaders when I say that failure was more common than success, and that the day for contour filling in the main has passed. It is recognized as a most valuable method to practice, but not as the most practical in all cases, even when possible. Extreme ideas have given way to more moderate and wholesome ones, and the beautiful, golden face that was so common on teeth in the days when we first played with our new toy is not so common now. Many a conscientious dentist has in sorrow lamented the day when he thought he could do impossibilities, and in bitterness has moaned: "A thing of beauty" is not always "a joy forever." In referring to the danger of leaving a thin margin of enamel at the neck of the tooth, I took pains to state that what was common in prepared sections, both of the developing and the developed tooth regarding the easy separation of enamel from dentine, was as easily demonstrated in the mouth. It is only necessary when the excavating and shaping of such a cavity are completed to put the dam on, dry out the cavity, and then draw a slightly-curved instrument upward under the enamel margin. It will be found that the enamel separates from the dentine very readily. This demonstration seems to me to prove my arguments to be sound and good. Too much stress was laid on my reference to Dr. Miller's statement that decay *might* continue under a water-tight filling if the bacteria of fermentation were not all removed or destroyed. A careful reading of Dr. Miller's monograph will show that he alludes to this more as a possibility than as a common occurrence, and referred to it merely as an explanation of some otherwise unaccountable failures.

The President. If I may be permitted one observation upon Dr. Allan's paper and the remarks that have been made, it is this: Dr. Allan has alluded two or three times to "the point of danger" after an approximal filling has been inserted, and Dr. Perry alluded to the same thing. Dr. Webb used to speak of "the point of defective manipulation," and Dr. Flagg was always talking about "the vulnerable point;" and these gentlemen all unite upon the same point, viz., the cervical margin near the gum. The concurrent testimony of all seems to show that the success of plastic and tin fillings, or gold and tin combined, in this locality, has been in part due to the fact that the V-shaped space, where the large end of the V is toward the gum, has been more carefully preserved when such fillings have been used

than when other fillings more pretentious and more difficult to insert have been employed. The natural forms of the teeth have certainly been less interfered with by such operations.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor New York Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Tuesday evening, May 4, 1886, in the rooms of The S. S. White Dental Manufacturing Company, Broadway and Thirty-second street.

The president, Dr. William Carr, in the chair.

Dr. C. F. W. Bödecker, chairman of the Clinic Committee, reported substantially as follows:

Mr. President and Gentlemen: There were about eighty persons present this afternoon at the clinic. . . . Dr. E. Parmly Brown, of Flushing, presented a lady patient with a piece of crown and bridge-work, which will be more minutely described in the paper to be read by Dr. Brown this evening. The bridge-piece consisted of three teeth united together. Besides these three teeth, the left upper lateral was also crowned. The work looked very well, and I suppose is very serviceable. Dr. Brown had also a patient there for whom he had filled a left lower first molar,—the distal and grinding surfaces. It was a very large filling and very nicely done. . . . Dr. S. C. G. Watkins, of Montclair, N. J., presented a set of three double-end instruments for trimming amalgam and other plastic fillings. The instruments are properly tempered, and very thin, so as to enable the operator to get at every point to remove surplus filling-material. Dr. Watkins also exhibited a modified form of his tooth-brush. . . . Dr. E. L. Swartwout, of Utica, filled a left upper central on its mesial surface and cutting edge. About one-fourth of the crown of the tooth was decayed. The excavating was done previous to the clinic. Dr. Swartwout used first Wolrab's cylinders, packing them by hand-pressure against the walls of the cavity, and finished with Watt's crystal gold. The operation was completed at the clinic and appeared to be perfect. . . . Dr. W. G. Hiller showed his new articulator flask, the details of which have been described at a previous clinic. . . . Dr. M. Rynear described his new method of mounting porcelain-faced crowns, the details of which are as follows: The root is first drilled out with a special drill, of which he furnishes the operator three sizes, and the end of the root then countersunk about

one sixty-fourth of an inch squarely down with a reamer into which a platinum cup or pan of proper size, furnished for the purpose, is accurately fitted. In the middle of the cup is a hole to receive a gold pin. The cup and pin having been adjusted, the platinum cup is thoroughly burnished against the lower surface of the root, and a tooth ground in proper position. The tooth, cup, and pin then being fastened tightly together with wax, the whole is withdrawn and soldered, and the crown is ready for attachment. . . . Dr. T. J. Thomas exhibited some porcelain crowns which were made for him more than twenty-five years ago by Dr. S. S. White, and which were at that time designed for bridge-work. Dr. Thomas claims that even as far back as that he practiced this class of bridge-work, which speaks rather poorly for the late bridge-work patents. . . . Dr. Starr exhibited a rubber set, made of Chase's prepared rubber, which showed a lining of gold on both surfaces. The rubber is prepared in such a manner that any kind of gold can be manipulated for the purpose of covering and adhering to it. It will, I suppose, be for sale by The S. S. White Dental Manufacturing Company.

Dr. S. C. G. Watkins. The instruments which Dr. Bödecker mentioned as having been presented by me this afternoon at the clinic I have here, and I would like to show them to the society. They are designed for the purpose of removing surplus filling-material and trimming around the approximal and cervical surfaces of plastic fillings, especially amalgam. As you know, it is often very difficult to trim amalgam fillings so that they will be just flush with the cervical wall, where the cavity extends below the margin of the gum; but these instruments are very thin, and so curved as to enable you to get around the necks of the teeth and trim the fillings on such surfaces almost as easily as at any other place. I believe that nothing of the kind designed for that purpose heretofore will accomplish the object as well. It has been said that it can be done with silk floss, tape, bibulous paper, and such things, but I have failed to accomplish with these different articles the desired result where the cavity penetrates beyond the margin of the gum, and that is the most important part. There are six of these instruments. Of these tooth-brushes, which were spoken of in the report of the Clinic Committee, there are two sizes. They are a modified form of what I have made and shown before. The object of the modification is to get at all parts of the teeth more easily, especially the posterior surfaces of the wisdom-teeth, and the lingual surfaces of the forward teeth. By a drawing motion around the posterior teeth and upon the lingual surfaces anything lodged there can be removed without difficulty, and by a rotary motion around the cutting edge from the buccal surface.

E. Parmly Brown, D.D.S., of Flushing, L. I., read the following paper describing his

System of All-Porcelain Bridge and Crown-Work.

Dr. Brown. Fig. 1 is a lateral view of a porcelain crown, with a platino-iridium pin baked in position. The pin has great strength at the neck of the tooth, where the strain is greatest, the porcelain of the tooth extending up on to the pin to increase the strength.

Fig. 2 is a front view of the same crown, showing by dotted lines the form which the metal occupies in the crown to increase the strength of the attachment, and prevent the pin from approaching the surface in thin teeth.

Fig. 3 is a view of the two-pin bicuspid crown, which affords a pin for each root of a two-rooted bicuspid, the staple form of the pin, shown by dotted lines, being a feature of strength.

Fig. 4 is a view of a bicuspid crown with the two pins pressed together, making a single pin for the one root.

The double pin in the bicuspid crowns prevents the loosening of these teeth by the rotary movements of mastication, which by

Fig. 1.

Fig. 2.

Fig. 3.

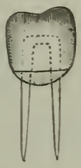
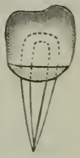


Fig. 4.



means of the two cusps exert such leverage as to turn and break down the ordinary crown where only one pin is used.

My bridge-work system has the metal baked invisibly through the body of the teeth. No metal shows either inside or outside of the dental arch. The six anterior teeth are riveted to the platino-iridium bar by the ordinary pins of plate teeth, which are the teeth used for this work. The bicuspids and molars are prepared by grinding a slot on the palatal surfaces of the teeth. The bar (which is squared for these teeth, instead of being flattened as for the front teeth) is inserted into this groove or slot, which should be ground with a thin corundum-wheel to fit the bar, which can be barbed to make proper impingement. It is then ready to receive the creamy tooth-body, which, at this juncture, is applied to the palatal surfaces of all the teeth, completely covering the metal and giving the natural contour to the inner surfaces. A little of the tooth-body is allowed to run between the teeth, uniting their approximal surfaces.

In this work, when cross-pin teeth are used, the pins will be ground out in most cases; but if straight pin-teeth are used the pins will be bent over the bar. I will give a few illustrations of the many ways in which this work can be done.

Fig. 5 is a view of a platino-iridium bar baked on to a plain plate tooth, by first riveting the flattened bar on the pins, then applying tooth-body to the back, completely covering bar and pins, and then baking in a continuous-gum furnace. The body can be applied readily of a creamy consistence, and, after being held a moment over a spirit-lamp, is ready to be put on the slide and baked.

Cavities or fillings are usually found on either side of a space made by the loss of a tooth or teeth that will allow the insertion of the ends of the metal bar and the thorough impacting of gold around them. Amalgam can be used in posterior teeth in many cases, or gold crowns penetrated by the bar, as in Figs. 6 and 7.

FIG. 5.

FIG. 6.

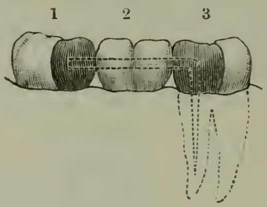
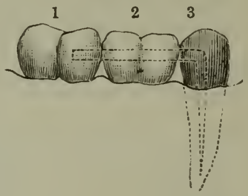


FIG. 7.



In Fig. 6, No. 1 is a third molar, pulp alive, with large filling; No. 2 is a porcelain bridge; No. 3 is a first molar, pulp dead, with a metal bar entering the pulp cavity.

In Fig. 7, No. 1 is a second molar, pulp alive, with a crown filling of gold or amalgam retaining the bar; No. 2 is a porcelain bridge; No. 3 is a gold crown with bar passing through crown into root.

Fig. 8 is a view of a bridge of two teeth,—a central porcelain crown with a lateral baked into it, the bar and pin being of the same piece, bent at right angles.

In Fig. 8, No. 1 is a porcelain crown forming part of the bridge; No. 2 a bridged lateral with metal bar baked through it; No. 3 a living cuspid with a metal bar running in the center of a solid gold filling.

Fig. 9 is a view of a central incisor bridged on to two teeth whose pulps have been lost.

As many as six teeth have been inserted in this way on two central roots, and the posterior end of the invisible metal bar running through the six teeth worked firmly into a gold filling in a molar—the six teeth being united on their approximal surfaces by the porcelain running between them at the baking. The backs of such teeth must be given a curved form to insure a cleanly condition.

Fig. 10 is a view of the attachment of the bridge to a tooth standing alone, where the tooth has a gold crown attached, or the bar is worked into a filling. Nos. 1 and 3 are teeth on a porcelain bridge; No. 2 the natural tooth over which the bridge is saddled.

All teeth for this bridge-work should be ground so that no considerable portion of gum would be covered, the teeth just touching the gum by a point only at the cervico-labial portion.

I will describe some of the specimens I have here. In the case that Dr. Bödecker referred to, of the young lady at the clinic, when she came to me I found the entire roof of her mouth covered with a rubber plate, on account of the loss of a single superior central incisor. I removed the plate, and made for her a duplicate of this case that I have on a model here. The three teeth are united together by a continuous piece of metal which runs through them and is bent at right angles to form the pins which enter the roots of the lateral and central—the intervening central being baked upon it. On the other lateral I put one of the new crowns which I have described

FIG. 8.

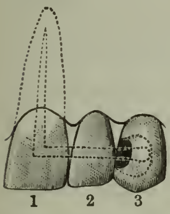


FIG. 9.

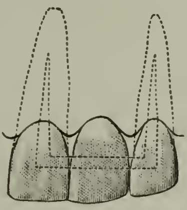
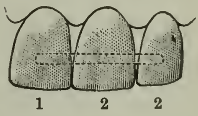


FIG. 10.



here. The lady's gums were very much diseased when she came to me, two or three weeks ago. I did not have much time to do the work, because she was about to be married. Inside of two weeks I have devitalized two of those pulps and applied these crowns. The teeth were mere shells, and the pulps very much diseased, two being exposed and the other dead. I applied arsenic to those two pulps. Three days afterward she came to me and I removed the pulps. She has had no pain, no sore gums, no inconvenience whatever. The work was done about ten days ago. I do not claim that her gums are in a healthy condition, for I only treated them for three days, and removed tartar from the teeth almost to the ends of the roots; but they are healing, and by following up the treatment her gums will be healthy in a short time.

I show here a case that I call a very interesting method of bridge-work. I am going to place in this mouth four pieces of bridge-work. It is the most discouraging mouth to put a plate in that I ever saw. There is only one reason why any dentist would put in a plate, and that is because one of the upper bicuspids is missing. In the upper

jaw I have the second bicuspid standing alone on the left side; the first bicuspid had split in two, having been pretty well filled. The second bicuspid is a near relation to that first one,—probably a first cousin,—therefore I decided to put a gold crown on it, to prevent its splitting, which will show very little in her mouth. I bridged in the first bicuspid, making somewhat of a cuspid tooth of it. I tacked on the bridge-work back a molar, which meets the two lower molars very nicely, and brings these teeth into active service. The cuspid had a cavity on the posterior side of it. Into that filling I run a bar, which holds the bridge-work on which these two teeth are baked. Having to bake the two teeth on the bar first, I necessarily could not run the bar into the hole in the tooth as I did there [illustrating], so I had to cut through the fissure in the bicuspid gold crown and solder it in. In the lower jaw, occluding with this which I have described, you will find two gold crowns. I would like the gentlemen here to examine the anatomy of those crowns. On the lower jaw the second molar had been lost, and the space was half closed up; but I bring these crowns out toward each other so that they knuckle together, bridging the space which was caused by the loss of the second molar. They fit perfectly in the mouth. I would also like the gentlemen to examine this first bicuspid particularly. That bicuspid has two pins baked in. The pins are rather small because the root is small. I would like to have you look at the anatomy of that tooth. I have ground a Bonwill crown into shape. In baking the pins in, the surface is fused over with enamel, and it looks as good as if it had never been ground.

Here is a case of a left upper central incisor which I put in for a physician several months ago, bridging it into two gold fillings. He had worn a gold plate for thirty-five years, and in all that length of time had not had any comfort with his mouth. He said it was a continual wiggle, wiggle,—pulling in and out. The clasps round the teeth had completely ruined the left upper cuspid and the left upper first and second bicuspids. I am going to crown the second bicuspid with a gold crown on account of its being a pretty solid tooth. This gentlemen, who lives near me, came in a month after the incisor was put in saying, "I want to shake hands with you, and tell you what a perfect luxury this tooth has been to me. I never realized what a cripple I was with that nasty thing in my mouth so long, until I had worn this tooth a few weeks, and compared it with that." He sent to me the young lady who was at the clinic to-day, and three others for whom I have done bridge-work.

Here is another specimen with two teeth baked together. Where this lateral was replaced the patient, a lawyer in New York, had worn for sixteen years a gold plate which had been a nuisance to

him. He told me that after this was substituted for the gold plate he went before the Supreme Court to argue a railroad case, and there was such an improvement in his enunciation that he would not have that gold plate back again for a thousand-dollar bill. He could sound the s's and enunciate some letters and words much better than when he wore the gold plate, which was slippery to the tongue.

These specimens of my porcelain crowns were made by The S. S. White Dental Manufacturing Company, and they are the best things I ever saw turned out as a first effort.

Dr. Littig. What furnace do you use for those small operations? Do you have a gas furnace?

Dr. Brown. I have one of the old furnaces. It is a terribly bad one. But if a bad furnace will encourage one as much as I have been encouraged by this work, you ought to be delighted with the work that a good furnace would turn out.

Dr. M. L. Rhein. At the meeting of the American Dental Association last summer, at Minneapolis, I was so much pleased with the specimens of this work which Dr. Brown presented there, that I made up my mind that the first case I thought a suitable one I would try his bridge-work on. In November last a lady of about twenty-two years came to me with a left superior cuspid root that she wanted re-crowned. She had been wearing one of the Weston crowns, which had come off on two or three occasions, and she was very poorly satisfied with it. The two bicuspids on that side were missing, and there was a very large anterior approximal gold filling in the first molar. I thought this would be a very good case for trying Dr. Brown's method, as the lady had all her under teeth, and took very good care of them. In making the piece for this case I slightly modified what I had seen of Dr. Brown's work at Minneapolis. Instead of putting the pin directly into the root, I first bent a piece of pure gold over the surface, with a hole through the center, in order to prevent the swelling of the root and the consequent trouble that might ensue. This case has been in the mouth since November. I have seen it within a couple of weeks, and the result bears out every one of Dr. Brown's prophecies, not only as to the beauty of the work, but also as to its durability.

President Carr. Will Dr. Brown let us know how he strikes up those gold crowns.

Dr. Brown. These two gold crowns which I asked the gentlemen to observe the anatomy of were taken directly from the natural teeth. On a block which I have here, which is taper or cone-shaped, is a natural bicuspid which I selected from some old teeth

and inserted, leaving the end protruding about three-sixteenths of an inch. The crowns were swaged up with a die from 22-carat gold. For making this die I molded the form in the sand and then poured zinc into it. You have here every line as close as you can get it in a mold of sand. The crowns were struck up on a solid, smooth, flat piece of lead, which is better than to have a counter-die. If you have a counter-die in this form, and drive the gold into a hole until it is driven entirely home, it is driven against air, against nothing, and therefore the entire surface of the metal is not being stretched laterally; but in driving it into the lead—which is not a new process—you spread the gold from the very center as you advance, and are not so apt to tear or break it. I use a piece of 22-carat gold about as big as a postage stamp; and after it is struck up as much as this die permits, and the four corners cut off the same as in making a pasteboard box, first flowing solder into the cusps to stiffen, I then bring the edges over with a pair of pliers and the corners together on an anvil, and solder one corner at a time,—soldering without a blow-pipe. I use the S. S. White 18-carat solder for this purpose. It flows in very beautifully. An alcohol-lamp, a pair of pliers, and dry borax do the soldering perfectly, and without the risk attending the use of the blow-pipe. Flow it in quite thick, so that you have a chance to dress away. It also gives you a chance to get a contour to the crown, on the approximal, labial, or buccal surface, as the case may be, which is important to make a correct crown.

Dr. Littig. Will Dr. Brown tell us what method he has for making a perfect adaptation between those porcelain crowns and the roots; what substance he puts between the artificial crown and the natural root in a simple crown like that?

Dr. Brown. The best fit that any human being could make would have absolutely nothing between. But that method of joining is impracticable. This is an interesting question. I find in several years' experience that, in nineteen cases out of twenty, oxyphosphate is the best filling to retain the crown. I have been putting them in almost every day for several years, sometimes as many as five in a day, and I have not had a single crown that failed, with one exception, and that was brought to me by a dentist in his own mouth, and he selected the tooth and fitted the whole thing himself, leaving a great gap by having the tooth too short. That cuspid tooth washed out, and we put it back with gutta-percha. All of these phosphate of zinc fillings are susceptible to attack from the strong alkalies. The acids which eat up the teeth and produce decay and break down dentures do not attack them, but strong alkalies do. I experimented for a long time with acids and salivas, and combi-

nations of acids, in connection with plastic fillings, but I did not touch the alkalies. That is where I made a mistake. The alkalies will not attack a filling if it is above the reach of the secretions of the mouth. The exudation that comes out around the necks of the teeth is not an alkali; and unless this oxyphosphate cement gets into contact with the secretions of the mouth it will not be affected by them at all. These fillings are attacked down where those alkalies reach, at the cervical walls. If the alkali eats up toward the root, beyond the margin of the gum, it has had its admission through an opening where the secretions of the mouth could enter.

You will be surprised at the ease with which you can grind off those teeth with a four-inch corundum-wheel. With such a wheel I can go within a hair of the pin without touching it. For twenty years I have ground cavities in artificial teeth with small corundum-wheels for the purpose of filling them with gold. Dr. Flagg, did you ever cut holes for such gold fillings with the corundum-wheel? How did you do it at the Centennial?

Dr. Flagg. I cut them all with a diamond.

Dr. Brown. I do not know it all, and no man knows it all. There are three men in this world to-day who have the biggest reputations in prosthetic dentistry,—Dr. Evans, of Washington; Dr. Campbell, of Paris; and Dr. Flagg, of New York. Yet some of them may not know the best way to mend a celluloid case where teeth are broken off. I was in Dr. Evans's office a year or two ago, and told him how to mend celluloid. He shook hands with me and said, "I will acknowledge that I never knew until this minute how to mend a celluloid case." I make this remark merely to show that men may not know all about some little point in their specialty, and that is the advantage of our exchanging ideas. So it is in grinding teeth. With a corundum-wheel you can grind teeth and cut roots anywhere. I find that I am cutting roots up under the gum further than I ever did before. If the gum heals below this margin or joint, you will have no attack on the oxyphosphate or oxychloride by the acids or alkalies in the secretions of the mouth.

Dr. Bödecker. I would like to say a few words in relation to what Dr. Brown has said about drilling cavities in porcelain teeth for the reception of gold fillings. I have for years used small corundum-wheels for that purpose; and besides those I usually use my old steel burs afterwards. At first I make the cavity with the smallest corundum-wheels and points I have, or can obtain; then I take an old engine bur, and while drilling keep it moist with spirit of turpentine which has been saturated with camphor. This will cut the porcelain beautifully. But in using burs do not run the engine fast, but very slow, and not always one way. Run it half a

dozen times to the left and then half a dozen times the other way. Thus the bur will make its own edge and be sharp all the time. It will grind very quickly if kept moist with the turpentine and camphor.

Dr. Flagg. I have something that I consider of importance to the profession, and with your kind permission I will go to the blackboard and demonstrate it. I think it is an error to destroy more of the natural teeth than is necessary. To be sure, it is said that we can replace what we destroy, but I doubt if we can replace it as well as nature had it before we removed it. We see roots in all stages of exfoliation and decay; but I believe that in nine cases out of ten where a crown is adapted to a root more of the tooth-substance is removed than should be. Very often an important portion can be left on the palatal surface and covered in, which will give you great strength in adapting an artificial substitute. Generally we cut it away. But when it is retained, no matter what extent the exfoliation assumes, it always leaves a free margin to the festoon of the gum. It is a most important element in the preservation of the root.

I want to ask Dr. Brown what the objection is to availing ourselves of that free margin. Here I have a case where, as you see, a portion of the tooth is allowed to remain on the inside, over which is placed a platinum cap, and as most of the strain of mastication comes from the inside, you can readily understand how that substance will assist in giving strength to the tooth and comfort to the patient in mastication. To whatever extent exfoliation may then go on, there is always some margin. I would like to ask what the objection is to utilizing this portion by capping it with a platinum cap that we can split, bend up, and burnish where we wish. You know nothing can get in there to wear out the cement that you attach the crown with. It seems to me that in all Dr. Brown's cases he has lost all the advantage he could have gained by letting the platinum cap come down over the root.

Dr. Brown. While Dr. Flagg was away in South America I was here at this blackboard showing a crown that I patented, and which covered that very point—a platinum band baked on a porcelain crown. But I found that the demand for that style of crown was so small that it would not pay the manufacturer to make them. Dr. John M. Crowell, who is here, knows all about the origin and making of this crown. Where you have a root that has a very loose attachment of gum, those cases will do very well for that band; but in trying to put that kind of a band on teeth where the attachment of the gum was very close, I found it was more of an annoyance to the parts than an advantage. I crowned three cases of that kind in a mouth two years ago, where I diagnosed that if I

made an effort to put the band up there it would probably produce recession of the gum. I put on two central incisors and a lateral at a single sitting for a lady. I saw her about six weeks ago, and they were there just as nice as her natural teeth,—no disturbance, no irritation, with not only no attempt at recession of the gums, but a decided attempt of the gums to come up and crawl over the cutting edges of the teeth.

Adjourned. B. C. NASH, D.D.S., *Secretary.*

NATIONAL ASSOCIATION OF DENTAL FACULTIES.

THE National Association of Dental Faculties held its third annual meeting in the Park Theatre, Niagara Falls, commencing Monday, August 2, 1886, President C. N. Peirce, Philadelphia, in the chair

The following colleges were represented:

Pennsylvania College of Dental Surgery.—C. N. Peirce.

Chicago College of Dental Surgery.—T. W. Brophy, A. W. Harlan, F. H. Gardiner, J. A. Swasey, and L. P. Haskell.

Missouri Dental College.—W. H. Eames and A. H. Fuller.

Boston Dental College.—J. A. Follett.

Philadelphia Dental College.—S. H. Guilford.

University of Pennsylvania, Dental Department.—James Truman.

Baltimore College of Dental Surgery.—R. B. Winder.

Dental Department State University of Iowa.—L. C. Ingersoll and A. O. Hunt.

Dental College of the University of Michigan.—J. Taft and J. A. Watling.

Ohio College of Dental Surgery.—H. A. Smith.

New York College of Dentistry.—Frank Abbott.

Kansas City Dental College.—C. B. Hewitt.

The following additional colleges were admitted to membership:

Minnesota Hospital College, Dental Department.—W. A. Spaulding.

Vanderbilt University, Dental Department.—W. H. Morgan.

University of California, Dental Department.—S. W. Dennis.

Harvard University, Dental Department.—Thos. Fillebrown.

Dental Department of St. Paul Medical College.—L. W. Lyon.

Dr. Winder, chairman of the committee on text-books, reported verbally that so much opposition to the plan submitted had been expressed last year that he had concluded to let the matter rest until this meeting so as to get the views of all the schools possible. Since he arrived here he had learned that a much larger number of the profession were in favor of the idea than appeared at the meeting in Chicago. A work is being prepared under the editorial supervision of Dr. Wilbur F. Litch, but it is an encyclopedia of dentistry, and

probably not what we shall require, which is a series of practical text-books. If there is a sentiment in favor of the movement to provide first-class text-books, the next thing to do is to go to work to get them up; but it is a task that cannot be hurried. Such a system of books would make the teaching in the different colleges uniform, and would put money enough into the hands of the publishers to insure the prosecution of the work. It would be a man of considerable temerity who would undertake the preparation of a work on operative dentistry, and the probabilities are that when completed the profession would have taken a step a long way in advance of its teachings. But we must have something, and the best thing we can do will be to get up the best we can.

After discussion, on motion of Dr. Guilford, a committee of five, consisting of Drs. Abbott, Winder, Ingersoll, Guilford, and Fillebrown, was elected to take the subject into consideration and prepare suggestions as to the general scope and plan to be followed in the preparation of a series of dental text-books.

Dr. Abbott offered the following resolution, which was adopted and referred to the Executive Committee:

Resolved, That a standing committee on schools be elected, whose duty it shall be to ascertain as far as practicable the workings of all dental schools in this country and Europe, and be required to furnish information to the dean or secretary of any college when desired and to report in writing at each meeting of this association.

Dr. Truman offered the following, which was adopted:

Resolved, That the dean of each school be required to furnish the executive committee with the exact character of the intermediate examination, and whether any of them are final.

Dr. Truman offered a resolution that the winter terms of all dental colleges members of this association shall be at least seven months in duration. On motion of Dr. Abbott referred to the representatives of the different colleges with the request that they report upon it next year.

Dr. Guilford was appointed as a committee to codify the rules adopted by the association and prepare them for publication in the annual announcements of the colleges.

Dr. Fillebrown, secretary of the committee on text-books, read the report, stating that in the judgment of the committee text-books are needed on the following subjects: Oral Surgery; Dental Pathology and Therapeutics; Operative Dentistry and Orthodontia; Dental Chemistry and Metallurgy; Dental Prosthesis. Books on other subjects seem to be very well provided for at present. The report recommends that committees be appointed to solicit the writing of such

books and to examine the manuscript and if found acceptable to authorize their publication as text-books on these subjects, with the indorsement of this association; that the publication of the various books shall be under the supervision of committees composed of the professors in the colleges of this association of the particular branch of study to which the book is devoted, or such persons as the faculties may select; that the committees shall have power to solicit writers for the subjects named and to require the books to be written upon a plan acceptable to the committee and that the final copy be submitted to every member of the committee and unless it receives the approval of at least three-fourths of the whole committee it shall not be considered approved; that each writer shall be expected to retain the complete ownership of his manuscript and to publish at his own expense and risk.

The report was adopted and the chairmen of the committees on publication were appointed, as follows: "Oral Surgery," T. W. Brophy; "Dental Pathology and Therapeutics," James Truman; "Operative Dentistry and Orthodontia," Thos. Fillebrown; "Dental Chemistry and Metallurgy," A. O. Hunt; "Dental Prosthesis," S. H. Guilford.

The following officers were elected for the ensuing year: C. N. Peirce, president; R. B. Winder, vice-president; H. A. Smith, secretary; A. W. Harlan, treasurer; Frank Abbott, James Truman, J. Taft, executive committee; Frank Abbott, James Truman, R. B. Winder, committee to decide questions arising before the next meeting.

Adjourned.

NATIONAL ASSOCIATION OF DENTAL EXAMINERS.

The National Association of Dental Examiners held its fifth session in the Park Theatre, Niagara Falls, commencing Monday, August 2, 1886, President J. Taft in the chair.

The following State boards were represented: Ohio, by J. Taft, H. A. Smith, and F. H. Rehwinkel; Illinois, by Geo. H. Cushing; Michigan, by A. T. Metcalf, F. W. Clawson, and G. S. Shattuck; California, by S. W. Dennis; Pennsylvania, by S. H. Guilford, W. E. Magill, and E. T. Darby; New Jersey, by Fred. A. Levy; Iowa, by J. T. Abbott; Maryland, by T. S. Waters; Louisiana, by Joseph Bauer; Indiana, by S. B. Brown; Wisconsin, by Edgar Palmer.

Officers were elected for the ensuing year as follows: J. Taft, president; H. A. Smith, vice-president; F. A. Levy, Orange, N. J., secretary and treasurer.

NORTH CAROLINA STATE DENTAL ASSOCIATION.

The twelfth annual meeting of the North Carolina State Dental Association was held in Raleigh, N. C., June 1, 2, and 3, 1886.

The attendance was unusually large, and most interesting and instructive sessions were held.

The following officers were elected for the ensuing year: B. H. Douglass, president; C. A. Rominger, first vice-president; H. C. Herring, second vice-president; Thomas M. Hunter, secretary; J. W. Hunter, treasurer.

The next meeting of the society will be held at Morehead City, beginning Tuesday, June 7, 1887.

Thomas M. Hunter, *Secretary*,
Fayetteville, N. C.

EDITORIAL.

DR. WILHELM HERBST'S AMERICAN VISIT.

Dr. Herbst, having been invited by the First District Dental Society of the State of New York to come to this country and give clinics, sailed from Bremen on the 19th of June, and arrived in New York on the 28th of the same month. He was officially welcomed by a committee of the society, who arranged a reception and dinner on the following Friday, at which a large number of distinguished members of the profession were present from all parts of the country. A dinner was also given in his honor by Dr. C. F. W. Bödecker, to which the professors of operative dentistry of every college in the country and other prominent practitioners were invited. Subsequently a complimentary dinner was given him by the dentists of Philadelphia.

In New York, in Philadelphia, at the meeting of the New Jersey State Dental Association, at Asbury Park, at Niagara before the American Dental Association, and elsewhere, Dr. Herbst gave clinics, in season and out of season, seeming to have but one desire —namely, to explain and illustrate to each and all whatever might be thought of practical value in his methods of practice. His modesty, no less than his geniality and earnestness, won for him appreciation and esteem. Everywhere he received a cordial greeting and hearty welcome, and by common consent, without regard to the adoption of his methods, he was pronounced not only a good fellow, but a genius. To what extent the rotation method which he taught and illustrated will be adopted in this country remains to be seen; but we are confident that no intelligent observer witnessed his clinics without having learned something of practical value in operative dentistry.

By a unanimous vote Dr. Herbst was made an honorary member of the American Dental Association, and he left our shores carrying with him the good wishes of every member of the profession with whom he had come in contact.

We are permitted to make the following extract from a letter written by Dr. Bogue to a professional friend, which expresses what may be called the conservative view of Dr. Herbst's methods:

I went twice to Dr. Bödecker's house to see Dr. Herbst, of Bremen, operate, and my admiration for him is very great. He has worked out, quite alone, as I understand it, the system of operating through which we Americans have been passing for the last thirty years. He has encountered the same difficulties, tried a dozen different ways, perhaps, to surmount them, and the dozen are about the same that we have tried. He has alternately been encouraged to accept or led to abandon certain tried methods, and he has at last, after "swinging round the circle," come back to the principles which were taught to us by our preceptors.

Dr. Herbst has adopted or added to the appliances which we possessed in our early days,—the dental engine (Morrison), the rubber dam (Barnum), the matrix (Jack), the principle of cohesion of gold at common temperatures (Westcott, Arthur, Dwinelle), its softness when covered by extraneous gases (Black), and round points for filling (Lord, Bronson). He now uses the dam, filling largely by hand-pressure and small points, with soft cylinders and ropes of non-cohesive gold at the bottom of the cavity, following up with his plugger, just as we used to, with a small burnisher finely pointed (the efficiency of which method has been so ably demonstrated by Dr. Shumway, of Plymouth, Mass.); only he makes his burnisher of garnet and puts it into the engine. When his cavities are big or badly shaped he surrounds them with a matrix of German silver, soldered together on the operating table with his alcohol-lamp and a bit of jeweler's soft-solder; reinforced, if need be, where there are no adjoining teeth, by a wire twisted around the outside of the matrix and in turn soldered to it, the whole taking from two to four minutes. He then goes on with his filling, using strongly cohesive gold, after the bottom of the cavity is covered with soft gold.

In packing his gold Dr. Herbst makes sure that the force applied drives it against the matrix. In this he agrees with Dr. Jack's instructions regarding the use of matrices. He sometimes places a layer of cotton between his burnisher and the gold to prevent adhesion of the burnisher and to act as a buffer. He tests his filling step by step as he goes along with a sharp-pointed plugger, to assure himself that his work is perfect.

He has cases of appliances which he has used and discarded, showing the development of his ideas all the way from their first inception to their practical working out. Among these appliances are finishing wheels, made by mixing corundum-powder with soft, unvulcanized rubber, then cutting out the center and inserting unvulcanized plate rubber into the opening and vulcanizing the whole. This makes a hard-rubber center with a soft-rubber cutting-disk on the outside, whose use is obvious. Other finishing wheels are easily made of the refuse from corundum wheels, vulcanized with hard rubber after dissolving out the shellac.

For cylindrical engine-burs, such as we pay a dollar and a half for, Dr. Herbst takes the worn-out socket from an "ever-pointed" lead-pencil, fastens it to the shank of an engine-bur, breaks off from a quarter to three-quarters of an inch

of a mouse-tail or rat-tail file, sticks it into this socket with shellac, and has a better bur than can be bought for money. He takes a large steel pen which approximates the cylindrical form of a tooth, cuts a hole through that portion which fits best, sticks it to the tooth (after the dam is in position) with Stent's impression compound, crowding the dam and the gum up together, and thus forms a clamp for inserting a labial filling far more effectual and perhaps less painful than the clamps that can be purchased.

For coloring fillings he pulverizes glass of various colors,—dark amber, blue, and red,—keeping it ready in small bottles.

When he wishes to fill the labial surface of an incisor, and have the filling but little visible, he takes an impression of his cavity, then mixes with water into a paste some pulverized glass of a color to match the tooth. After molding his paste into the cavity of his model he vitrifies it in his muffle, and sets his glass filling in, mosaic fashion, with a thread of gold at one edge and cement at the other, or perhaps entirely surrounding the glass filling with the thin thread of gold. This gold thread is simply a narrow filling, packed like any other filling.

For fertility in invention of means to accomplish ends in little matters I think I have never seen him surpassed. He is so fruitful in resources, or what we often call "dodges," that one is surprised at the simplicity of what at first sight seem to most men complex operations.

NINTH INTERNATIONAL MEDICAL CONGRESS.

The Council of the Section on Dental and Oral Surgery of the International Medical Congress held several sessions at Niagara during the meeting of the American Dental Association. Professor Taft, president of the Section, expressed his gratification at the prospect of a large attendance of both American and foreign members of the profession, and of an abundance of original papers. He believed that the sessions of the Section would exceed in practical value all previous ones.

It was deemed desirable to invite through the journals correspondence with the secretaries from those who may have anything to offer. The American secretaries are Dr. E. A. Bogue, No. 29 East Twentieth street, New York City (from September 1, 1886, to January 1, 1887, No. 39 Boulevard Haussmann, Paris, France), and Dr. F. H. Rehwinkel, Chillicothe, Ohio.

OBITUARY.

DR. J. L. SUESSEROTT.

Died, in Chambersburg, Pa., July 16, 1886, Jacob L. Suesserott, M. D., D.D.S., in the fifty-eighth year of his age.

Dr. Suesserott was born in Chambersburg, February 20, 1829. He studied medicine with Dr. S. H. Senseny, of Chambersburg, and dentistry with Dr. J. H. McQuillen, of Philadelphia. He graduated from Jefferson Medical College in 1851, and subsequently received the honorary degree of D.D.S. from the Pennsylvania College of

Dental Surgery. Immediately after his graduation he began the practice of medicine and dentistry in his native place.

In 1858 Dr. Suesserott was chosen professor of the principles of dental surgery and therapeutics in the Pennsylvania College of Dental Surgery, which chair he filled with great acceptance until August, 1862, when the demands of his practice compelled his resignation of the professorship. Dr. Suesserott took a deep and active interest in whatever was calculated to advance either the science or the art of dentistry. He assisted in the organization of the American Dental Association, was prominent in the formation of the Pennsylvania State Dental Society, served as the first president of the Cumberland Valley Dental Society, and was a trustee of the Philadelphia Dental College from the time it was chartered until his death. As an operator Dr. Suesserott was regarded as possessing more than average skill, and as a teacher he labored to prepare those whom he instructed for an intelligent practice of their chosen profession. In later life he was a delegate to the American Medical Association, a member of the Medical Society of the State of Pennsylvania, and of the Franklin County Medical Society. He expired in the same room in which he first opened his eyes to the light of day.

Dr. Suesserott was repeatedly chosen to positions of trust and honor in his native town, and none of its citizens took a deeper or more active interest in whatever was calculated to promote its highest welfare than did he, and none will be more missed by all classes. He had been in failing health for some months, his disease no doubt aggravated by anxiety for his beloved wife, who for several years battled with a malady which he knew must finally end her life. She preceded him to the other world by less than three months.

Dr. Suesserott leaves two sons and three daughters. The elder son, Charles A. Suesserott, is a member of the Franklin county bar, and the younger, Dr. L. P. Suesserott, was associated with his father in and now succeeds to his medical practice.

HINTS AND QUERIES.

In answer to F. E., in July Dental Cosmos, I would suggest bromide of potassium in five grain doses, taken every hour, until the nausea is overcome sufficiently to enable the patient to retain the plate, the same to be repeated whenever the feeling returns. If the patient will persevere in this treatment, wearing the plate as much as possible, I think in a short time it will cause little or no trouble on account of nausea.—C. O. P., *Petaluma, Cal.*

Reply to F. E., who asks, in the July number, how to overcome the nausea caused by wearing a dental plate: Let the patient rinse the mouth six or eight times daily with a solution of bromide of potassium—ten grains to the ounce;

also gargle with it, and swallow a small quantity each time. Rinsing the mouth with cider brandy frequently is also an excellent remedy.—H. S. Fisk.

A Movable Piece of Bridge-work.—Miss A., a teacher by profession, when quite young, lost the left upper lateral incisor. The cuspid moved forward until it approximated the central, leaving an inter-dental space posterior to it the width of a lateral. The second bicuspid having also been lost, she desired a substitute for the missing teeth, but was desirous to avoid the use of a plate. The remaining bicuspid having a very decided bell-shaped crown, the problem was to make, without grinding the crown down to the same diameter as its cervix, a bridge that could be removed for cleansing, and I finally solved it in the following manner: After obtaining a plaster cast of the case like Fig. 1, I took a piece of gold plate, No. 24 gauge, and bent it in a shape resembling the figure five, the loop passing around the buccal side of the bicuspid; the straight part extending from the mesial center of the bicuspid to the distal center of the cuspid. This part of the band formed the backing for my artificial cuspid. Another band

Fig. 1.

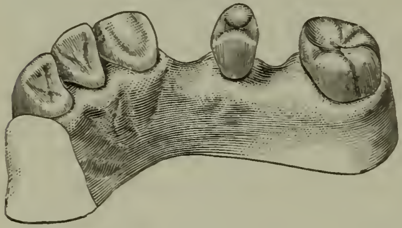


Fig. 2.

Fig. 3.

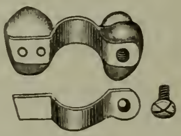


Fig. 4.

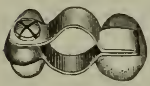
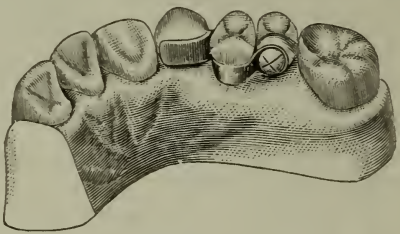


Fig. 5



was made for the palatal side of the bicuspid, with an arm extending across both inter-dental spaces (Fig. 2). To the anterior extremity of the arm a cuspid, which had been ground to fit the gums, was riveted. Then a solid gold crown was made with a porcelain face, the solid backing being given the required thickness to receive the screw hereinafter described. After the gold crown was nicely fitted to the gums, it was connected to the buccal loop of the bridge, and after all parts were properly adjusted in the mouth, the pieces were riveted, invested in asbestos and plaster, and soldered; after which it was finished up nicely, and a hole, No. 15 gauge, was drilled through the loose end of the palatal band into the gold crown. The hole in the gold crown was cut with a tap, and a gold-headed platinum screw was passed through the loose end of the band into the gold crown. The parts in detail are shown by Fig. 3. The screw, when drawn up tight, brought the loose end of the band firmly against the palatal surface of the gold crown and bicuspid, making a very firm bridge, and one that could be removed for cleansing. (See Fig. 4.) After the bridge was completed and adjusted to the mouth, the natural cuspid was ground off so as to conform as nearly as possible to the lateral whose place it occupied. Fig. 5 shows the bridge in place on the cast.

By the use of dies, two half caps could be struck up and the parts secured by two screws, as is apparent from Fig. 6. If desired, in a case like that illustrated, the molar could be included as an additional support for the bridge, the parts of which are seen in Fig. 7, and the same completed in Fig. 8.

As there are grand possibilities in bridge-work (the greatest objection being the

FIG. 6.

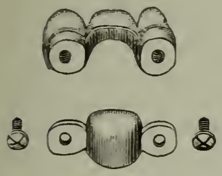


FIG. 7.

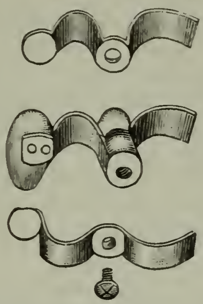
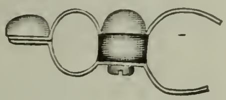


FIG. 8.



difficulty of cleansing), if some method can be devised whereby it can be made firm enough for mastication, and removable for cleansing, I think we shall have made another step in the right direction.—L. M. MATHEWS, *Fort Scott, Kansas.*

A NEW MODE OF TAKING AN ARTICULATING IMPRESSION.—In taking articulating impressions desirable results may be obtained by the use of two sheets of mica ("isinglass") placed together in the lump of warm wax to be used for taking the "bite." Each sheet is laid on a flat surface and warm wax pressed upon it, and then brought together, the overlapping edges of wax being pressed together so as to hold the two pieces as one until the whole is in the mouth. But, first, a slip of wood is pushed into the wax from the front and just a little aside from the median line, the sheets of mica having had V-shaped spaces cut in them to permit the stick to penetrate the wax sufficiently to act as a handle, and at the same time to prevent the jaws from closing any more than is desirable. In many cases the width of the bite may be determined by the size of this stick, previously whittled to the width desired.

The mass is now placed in the mouth and the first closure made. The operator will then insert his finger, and, in pressing the wax down against the teeth, also sever the slight connection of the edges of the wax, and then the mouth may open and shut freely, indicating by repeated closures what is the correct relative position of the jaws during occlusion. But should the divided halves not separate freely a thin spatula may be run between them.

Before withdrawing the bite from the mouth the halves may be fastened together by running a hot instrument into the space left in the wax by the stick of wood.

If an excess of wax is used so as to necessitate the cutting away of some of it to allow the lip to fall into its proper position, one or both halves may be easily removed from the mouth and replaced.—STEWART J. SPENCE.

EUGENOL.—I do not remember to have seen anywhere a fully appreciative notice of *Eugenol* among the lists of drugs used as disinfectants, antiseptics, deodorizers, and obtundents. It is a superior agent in all these particnlars, and is free from the objectionable characteristics usually belonging to the class. Though sharp to the taste, it is not especially disagreeable. It is not caustic, like carbolic acid and creasote. It is not destructive to the tissues, and there is nothing to fear

from a little excess in using. It can be employed without extra caution for thorough saturation of infected dentine, or passed freely to the extreme points of root-canals. While it thoroughly disinfects, it does not cauterize. It does not coagulate the albuminoid surface, leaving material for putrefaction beyond in pulp-canal and dentinal tubules, as carbolic acid does, but penetrates, saturates, mummefies, and *stays*. A root-canal in which it has remained a day and a night is safe to fill, though previously septic.

Eugenol represents the strength of the essential oil of cloves. Whether its virtue comes from additional oxygen, as claimed by some, or mere exclusion of non-essential elements, I know not; but this I do know, that it is good. I have used it, to the exclusion of other agents in most cases, for nearly three years, and with great satisfaction. No other agent has contributed so much to my success in the treatment of pulpless teeth. As a pain obtundent, by application to super-sensitive dentine, eugenol has the virtues multiplied of the time-honored oil of cloves. This, with its disinfectant qualities and general innocence, gives it a value above any agent with which I am acquainted for use in teeth containing living pulps.

I believe eugenol has not yet found its way into the stock of druggists generally. Care must be exercised in ordering that the common oil be not substituted. Western druggists and dentists may obtain it of E. H. Sargent, 125 State street, Chicago, and I presume wholesale dealers generally keep it in stock. Every dentist should have it. It is indispensable.—Garrett Newkirk.

The Stellwagen Incising Forceps.—I often wonder if dentists fully appreciate the great value of these excellent instruments. I meet with cases which I should not know how to deal with without them; cases of strong, massive jaws, and dense processes, containing roots whose crowns have been lost and so weakened by decay as to crush under the forceps, or not permitting sufficient hold for extraction. In such cases I cut through the process at a sufficient depth to enable me to obtain a firm hold of the root, and so remove it with ease. In a recent case I attempted to remove some very firm molars, but with all the force deemed safe was unable to break up the attachments. With the use of these forceps their removal was easily accomplished. Of course they need to be used with discretion to avoid the infliction of unnecessary injury to the parts.—J. W. Plummer.

Holes in Rubber Dam.—All the merely mechanical devices for plugging holes in the rubber dam are defective and liable to leak; often in the way of work, and not unapt to fall into the mouth at the risk of passing down the throat. The best way is to dry and temporarily protect the under side of the dam near the hole with spunk or bibulous paper; dry also quickly the other side around the hole, and with some rubber cement cover it with a patch of the same rubber dam cut to suit the case. If the cement is what it should be this patch will be firm and tight at once. The "weepers" sometimes most annoyingly found about the necks of the inclosed teeth may likewise be patched or choked with rubber cement.—S.

An Improved Method of Combination Gold and Rubber Work.—Under the above caption, in Hints and Queries, in your July issue, I notice a communication from A. S. Richmond, New York.

This method was introduced to the profession of New York City by myself some ten years ago. Specimens of the work and instruments were exhibited at a meeting of the dentists, and the instruments now in my possession were made at that time by Mr. Biddle and by Dr. S. S. White.—W. S. Elliott.

THE

DENTAL COSMOS.

Vol. XXVIII. PHILADELPHIA, OCTOBER, 1886. No. 10.

ORIGINAL COMMUNICATIONS.

SOMETHING ABOUT REGULATING AND REGULATING APPLIANCES.

BY GARRETT NEWKIRK, M.D., CHICAGO, ILL.

One of the first considerations in the matter of mechanical appliances for regulating teeth is that of caution,—to avoid the use of what may be injurious or dangerous.

First, it is best to avoid so far as possible all detached small appliances. If these have to be used, they should be in some way securely fastened. A failure to attend to this precaution is inexcusable.

Accidents of swallowing or lodgment in the larynx and trachea of small plates, etc., have been of late frequently reported. In the use of any appliance small enough to be so swallowed or lodged the danger exists. To this class belong small plates with one or two teeth; gold or platinum bands with bars, levers, and hooks soldered to them; short wire springs not attached to plates,—in short, anything small enough to get into the alimentary or air passages. As before said, it is best to avoid their use wherever we may; and this is especially true as regards those to be tied in. The knot of a ligature may slip, or the thread may stretch or break; and it is no advantage to a tooth to be kept in contact with thread saturated as it may be with some erosive solvent or agent of fermentation. The ligature speedily becomes offensive, and cannot fail to be more or less injurious. Were the ligature in itself innocent, its use prevents the proper cleansing of the teeth, and it is often unavoidably an irritant to the surrounding soft parts. As a temporary expedient, the ligature may be tolerated, but not otherwise.

Gold and platinum bands, etc., that may be fitted closely to the teeth and driven on, or fastened with cement, are objectionable only that they favor a condition of uncleanliness about themselves often difficult to avoid.

One chief advantage of the Coffin spring is the possibility of maintaining a condition of comparative cleanliness while the work is going forward. This is something never to be lost sight of by the dentist when called upon to decide between the various plans available in a given case.

The springs recently recommended and described by Dr. Talbot to be used without plates have this in their favor, that they are cleanly. They will, for this reason, aside from the simplicity of their construction, be a valuable addition to our list wherever their use is practicable. I should not consider it safe, however, to use some of the smaller forms he advises, for reasons already given. They are not too large to pass into the larynx or beyond, where they would be very ugly tenants. In use they ought to be tied in very securely indeed.

All mechanical force is exercised between two points of resistance. In order to effect anything, one must be sufficient to overcome

Fig. 1.

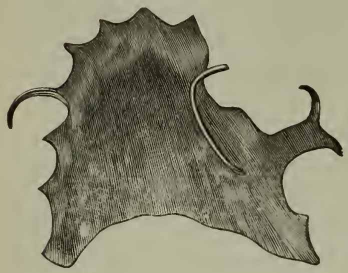


Fig. 2.

the other. In leverage we speak of these as the fulcrum and the weight, and sometimes we speak of movement from a "base." When a railroad engine starts, its basal point of resistance is the track and road-bed. The earth quivers with the effort; but the opposite point of resistance, the weight, is overcome, and the train moves When a rifle is discharged, the separate points are the weight of the gun and that of the ball. If the first be insufficient it is supplemented by the shoulder of the man, perhaps to his sorrow.

When teeth are to be moved the difficulty often presents to get a base resistance broad enough and strong enough to bear the strain of necessary force without being itself moved. In other words, the body to be moved has greater resistance than the base or fulcrum on which we have placed our dependence. This applies to the treatment of all malpositions of a one-sided character involving one, two, or

several teeth. When the deformity is double and nearly equal, as it often is, we make each the basal point for the movement of the other. This we usually speak of as "spreading the arch," and much skill is sometimes demanded to make the resistances equalize.

When movement is desirable at one point only, we strengthen the basal resistance by extension. Herein is the advantage of a plate,

Fig. 3.

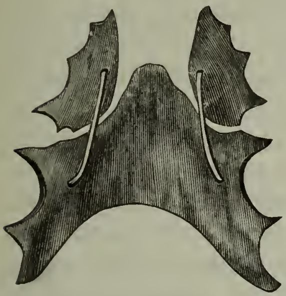


Fig. 4.

which enables us to distribute force over such an extent of surface that only a small proportion is felt at any one point.

In Fig. 1 we have the representation of such a plate. In Fig. 2 we see it in position.

A very large proportion of the arch is made to do service for basal resistance in the movement of a left upper cuspid. The point of the wire rests in a small pit drilled near the point of the cuspid. The tooth was carried to position in about six weeks. I would much rather do such an operation in six weeks than in two. There is no danger like the danger of haste in these cases.

Fig. 3 illustrates a modification of the Coffin plate, used for widen-

Fig. 5.

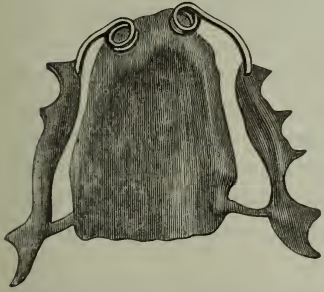
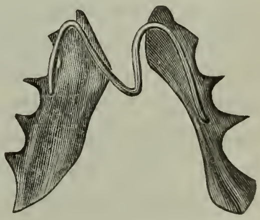


Fig. 6.



ing the arch anterior to the molars. Here the points of resistance were opposite and nearly equal, but this plan admitted adjustment on each side separately. Piano-wire of large size—Nos. 18 to 21—is used in these cases, and stout pliers, usually the round-nosed, for bending, and twice a week is often enough as a rule. The figure

shows the plate as it was at the close, after several turns of the wire. At first the front sections of the plate had been nearly together.

Fig. 4 represents a plate similarly constructed for spreading the arch posteriorly.

Fig. 5 exhibits one form of plate for carrying out bicuspids and molars which succeeded admirably.

Fig. 6 shows a modification of the "split" plate, with a wide division to facilitate the ready bending of the wire.

A word more as to the wire. As a general rule, only the heavier forms can be depended on to do the work demanded. In the bunches of "assorted" kept by the dental depots more than half the wire is valueless for regulating purposes. It ought to be kept in rolls (or half-rolls) such as one may get at the piano houses. Piano-wire is somewhat obstinate to handle until one becomes familiar with its properties. It will bear any amount of curvilinear, but not much abrupt, bending. It may be straightened from the coil with stout pliers, or by fastening the end in a vise. It is easily broken off by forcibly flattening or indenting it at a given point with the wedge-end of a hammer.

The end of the spring to be inserted in rubber should be thoroughly flattened on the anvil to prevent possible turning.

THERAPEUTICS OF FUNCTION.

BY V. E. TURNER, D.D.S., RALEIGH, N. C.

(A Paper read before the North Carolina State Dental Association, at the meeting in Raleigh, June 1, 1886.)

A GLANCE at the literature recently published in the interests of dental surgery will show that unusual attention is being directed to the development of the teeth by the writers and thinkers in the profession. As many of those present can testify, this subject has often been the burden of my song. At our meeting four years ago I took the ground that the simple use of oatmeal and cracked wheat or other coarsely-ground cereals would not remedy the evils complained of, and that a more perfect digestion and a greater functional activity of the organs were necessary for a healthy development. Now that more light seems to dawn upon us, I cannot resist the temptation to supplement what has already been said upon this subject.

I cannot comprehend why the increased liability to decay shown in the teeth of each succeeding generation should not arouse a deeper interest among us all. If necessity is the mother of invention, the fact that our profession is a young one is accounted for in that, as long as man lived according to the design of the Creator, so

long he had comparatively little use for a dentist, but as luxurious habits crept into his manner of living he began to feel the necessity for help in the care of his teeth. Hence dentists began to multiply. The establishment of the first dental college was less than fifty years ago; now we have nearly a score of such colleges (1500 matriculates last year), and yet they do not seem to be able to turn out dentists as rapidly as they are demanded by the public. We cannot doubt that there is some special cause for the deterioration of these particular organs, when the other organs of the body seem to be more perfectly developed.

What, then, is the cause of this degeneration of the teeth? When we recognize the revolution which has been effected in the preparation of our food, we find that it has become our habit to live on a diet which requires but little exercise of the dental apparatus. As Prof. Peirce says in a most excellent article on this subject, we can wash down the greater part of a modern meal. And we not only employ this expeditious way of taking our nourishment, but we allow our children to follow our example.

Now, there is one law in nature to which there seems to be no exception, and that is that each organ must be exercised in order to have a healthful development and to maintain a healthy existence. The nerve-centers are notified whenever pabulum is required to nourish and build up an organ,—a want created by proper functional activity. In obedience to such call worn-out material is taken up, and the organ is supplied with new material to supply the waste,—the quantity supplied being according to the functional activity of the organ.

The athlete becomes such by constant training. The unusual muscular development presented in his organization is but the working of this simple law. If an arm were to be placed in a sling, or so bandaged that it could not be used, it would soon become useless. Nor can the strength be restored except by use. A trotting-horse which thirty or forty years ago could make a mile in 2:40 was thought to be a marvel of speed, but now "Maude S." makes it in 2:08¾. This almost incredible speed is a simple matter of training. No horse could make such speed without months and years of training. A most forcible illustration of this principle is shown in the case of a cow living in the meadows, where she crops the grass with a dental organization especially adapted for such a purpose. As long as she thus procures her food her health will be good and her teeth will not give out. But place her in confined limits, and feed her on swill, which requires no mastication, and in the course of a few years, if you will examine her teeth, you will find that decay has set in; that she has inflamed gums and periostitis, and if forced

to continue this mode of life her milk will be unfit for use. Another example bearing upon this point is shown in the pet dogs in large cities which are fed upon cooked food requiring but little mastication. They are often troubled with sensitive and decayed teeth, which are unheard of in dogs which live upon raw meat and bones that require mastication. Why should human teeth be an exception to this law of development and health from use? Is it not a fact that those people who have not attained this higher civilization show less of this deterioration of the teeth than we do? Take the Scottish peasantry, who live mostly on coarse black bread, and you will find a finer dental development than in our crowded cities.

To come a little closer to every-day practice—I have often seen molars which were so seriously decayed that I thought it almost useless to attempt any treatment having in view their preservation, the whole grinding surface having been denuded of enamel, shortened an eighth of an inch, and sensitive to the touch. I have left such teeth, expecting to extract them within a few months, but the patient by repeated efforts gradually began to masticate upon them, and soon the surfaces which were all discolored and ragged would commence to assume a smoother appearance, and in a few years they would not only cease to be painful, but become almost as useful as any other teeth. I know of many cases of this kind,—one very notable instance in a mouth which had three or four just such teeth, that twenty years ago I expected in a few months would have to be removed; but they are there still, doing good service.

It is an acknowledged fact that tobacco-chewers have in the main better and stronger teeth than those who do not chew; and as far as can be discovered the juice of the weed plays no important part in preserving them. The improved quality must be due to their increased activity. It is very often the case that, owing to the loss of some important grinders, or the discomfort arising from some sensitive places, persons contract the habit of chewing almost exclusively on one side of the mouth, and, when such has been the habit for any length of time, you will generally find the teeth on the side most used are in a more healthy condition than the others.

All of these facts go to prove that function plays a most important part in the health of these organs.

When teeth first make their appearance in the mouth, and for several years after, they are generally loose in texture and lacking in perfect calcification, in which condition they are easily affected by any solvent which is formed in the mouth or brought in contact with them; but it is a notable fact that we often find the same teeth improved in density and resisting decay more successfully after the patient has given them several years of active service. As Dr. Kings-

ley says in discussing this subject, the cause of decay may always be present in every mouth, but the teeth are affected in proportion to their power of resistance. That which might produce rapid decay in soft, fragile teeth in a few months might have no appreciable effect upon hard, flinty teeth for many years.

Now, if it is true that people who live upon soft food, rich soups, etc., show in each succeeding generation that their teeth are becoming weaker and are an easier pray to disease and decay, and on the contrary those who live upon food requiring greater activity of the dental organs present no such deterioration, then we are forced to subscribe to the theory advanced.

But you will say, admitting this to be true, modern science has placed within the reach of almost all civilized people the means of preparing food that is palatable and tempting (and wholesome), but leaving little mastication to be done; the old-fashioned coarse bread, has been substituted by the more appetizing fleecy rolls, soft bread, etc. What are you going to do about it? Are not the people joined to their idols? I fear this may be true, at least for the present, but it is a strong point gained to discover the cause of so much pain and disease, and it may not be drawing too much upon the possibilities of the future to claim that the genius which has made so many strides towards perfecting operations to save diseased and decayed teeth might solve the problem of cultivating a better class of teeth, and formulate a system of hygiene which would not only be attractive for its promise of happy results, but be preferable as a matter of actual pleasure.

It must be our ambition to press vigorously on in the labor of correcting errors fraught with so much unhappiness and ill health. We are generally ministering to the wants of the most intelligent class of every community, and it is not unreasonable to hope that, by a careful and forcible presentation of this subject, we may be able to secure their co-operation. At any rate, let us set the example in our own families.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION.

Second Day—*Morning Session* (Continued).

(Continued from page 505.)

Unanimous consent was asked and granted to permit Section IV, Operative Dentistry, to report.

Dr. E. T. Darby, chairman, read the report, which, in view of the fact that during the past year nothing of a startling nature had

been developed in operative dentistry, as a matter of interest sketched briefly the principal changes that have been wrought in methods and materials during the quarter of a century the association has been in existence. Improvements and changes have followed each other in such rapid succession that we have learned to expect something new and startling almost daily. The topics considered were the various forms and weights of gold foil which have successively claimed attention, finally settling upon a medium in thickness and cohesive quality; the mallet, which in some form is to-day in the hands of almost every practitioner; the multiplication of amalgams; the conservative treatment of the pulp; the New Departure; the rubber dam, which was characterized as the greatest invention which has been given to the profession in the past two decades; the dental engine, with which the dentist now accomplishes in minutes what he formerly did wearily in hours; permanent separations and contour restorations. The subjects, although very briefly touched upon, were presented in a manner to invite the thoughtful attention of practitioners. The report closed by presenting a number of appliances for the consideration of the association. A description of these as given before the association will be found at the close of the discussion on Section IV.

Dr. George W. Melotte, Ithaca, N. Y., thought that the report was not complete, inasmuch as it made no reference to the very excellent system of crown and bridge-work which had been shown by Dr. Knapp.

Some discussion ensued as to whether the subject should be considered under Operative or Prosthetic Dentistry. The supplemental report of Section I, referring to Dr. Knapp's methods, was presented at a subsequent session, as stated last month.

On motion of Dr. Fillebrown, Dr. Wilhelm Herbst, Bremen, Germany, was then invited to address the association.

Dr. Herbst received a hearty welcome on arising. He spoke in German, his remarks being interpreted by Dr. C. F. W. Bödecker.

Dr. Herbst thought he had made some improvements in the methods of packing gold in teeth. By the method which he had developed the gold is secured in the cavity by rubbing it firmly to place. By this means you secure a much better adaptation of the filling to the walls than when the gold is put in with the mallet. In working by this method everything depends upon the cavity. Every cavity that has not four walls must be made so; the means to accomplish this he has demonstrated before most of the gentlemen present. The improvement of which he had spoken is very great, so far as the patient is concerned, for the patient will at once notice the difference between this method and malleting. All the

qualities found in a first-class filling put in by the mallet should be expected in one introduced by the rotation method: the weight of the gold, perfect adaptation to the walls, the connection of each portion of gold with the others, and the time consumed in making the filling. He had come to this country because he knew, as every one else knows, that the best men of the dental profession are here, and he felt that they would be honest and generous with him. He had shown his method to his confrères in Germany, and they had done very little with it. Of course, in this country there are many operators the like of whom the world outside cannot produce. They could probably do more than he had been able to do, but he thought that the work of filling teeth could be more easily done by this method than by any other, and that the art could be acquired by men with less skill than the malleting methods demand. He did not believe, nor did he hope, that the use of the mallet, especially in placing the last layers of a filling, would be abandoned; for probably it was better than the rotating method in that part of the work. He asked his hearers not to throw his method aside without a trial, as he was assured that both they and their patients would derive satisfaction from it. He saw before him some of the best operators in the world. Many of them look worn out. To these he would say that they could save time and do their work easier, at least a large part of it, with the rotation method than with any other. Dr. Herbst closed his remarks by expressing the hope of again seeing all whom he had met during his present visit at Washington next year.

Dr. Louis Ottofy, Chicago, Ill., would like Dr. Herbst to state the advantages of his method.

Dr. Bödecker, at the suggestion of Dr. Herbst, replied that the first claim is that the adaptation of the gold to the walls of the cavity is better than by any other method. This has been proved to the satisfaction of every one who has seen it, as well as by experiments. That is one of the greatest advantages, for adaptation is what saves the teeth. You cannot get absolute adaptation by hammering the gold in. On the contrary, by the Herbst method the gold is pressed into every pit and irregularity by the rotating bur. Examined with a microscope, the adaptation of a filling properly inserted by this method is found perfect. Fillings put into glass tubes show no discoloration at the sides when the tubes are filled with colored solutions; while those put in with the mallet will permit the solutions to percolate through. At least half of the cavities upon the approximal surfaces of the bicuspids and molars extend under the gum. In these this method will save time as well as offer a simpler way of filling. The last layers of a filling are somewhat

difficult to adjust by the Herbst method; these can be advantageously put in with the mallet. Another great advantage is that patients who have had operations performed by this method will ask for it again rather than suffer with the mallet.

Dr. Bödecker took the opportunity to speak of a method of obtunding sensitive dentine which had been shown to him two years ago by Dr. Herbst, but of the safety of which he was for a time doubtful. The obtunding agent consists of chemically pure sulphuric acid saturated with hydrochlorate of cocaïne; stir till the cocaïne is well dissolved; then to this solution add sulphuric ether to the point of super-saturation, stirring with a glass rod,—not shaking it, as that might cause it to burst the vessel or force the cork out. A better way to make it is to use a long test-tube. (If the sulphuric acid becomes dark when the cocaïne is added it shows that the cocaïne is impure.) A little of the solution is then applied to the sensitive cavity, and the effect is beautiful. You cannot obtund the whole of the dentine at once,—only a layer at a time, and when this is removed, another application of the obtundent is made. You can proceed with the excavation in two minutes after the application is made.

Dr. Taft. The composition and the effects of this obtundent seemed very peculiar when he was first shown it by Dr. Herbst, and on his return home he had made a quantity. One drachm of sulphuric acid dissolved thirty grains of cocaïne crystals. The quantity of sulphuric ether is immaterial, enough only being required to saturate the solution. He has used it almost daily, and in every instance it has been successful. Whether this unvarying success has been due to the properties of the material or to the character of the cases in which it has been used, he could not say. The method of its action probably is that the sulphuric acid dissolves a portion of the dentine; and the cocaïne obtunds it during this process. The ether is for the same purpose, he apprehended.

In regard to the rotation method of filling teeth, while it may not be generally adopted as the usual practice, it certainly has features which may be utilized by every operator. It is difficult to learn from printed instructions, as many other things are; but an intelligent person witnessing an operation performed by this method will readily catch ideas that can be well wrought into his practice. Heretofore many objections have been raised to it, but on witnessing it those who have objected learn just what there is in it, and he had no doubt that many would adopt it in a large number of cases. We often find a cavity of peculiar form where it is desirable to make as little cutting as possible,—a cavity without special angles or depressions. In many such cases a large mass of gold is packed in with which it is difficult to secure thorough adaptation; while being

condensed at one portion of the cavity it will draw to another. Another method is to put in small pieces of gold at a time, holding them in place while condensing. He had been much impressed with Dr. Herbst's way of managing this class of cavities. He puts in enough gold to line all of the cavity; then places a little wad of cotton over it, starts the burnisher, and keeping the cotton between the instrument and the gold, goes all over the cavity with pressure. He then removes the cotton and again goes over the surface with the burnisher, when the adaptation is perfect, he was going to say, only one needs to be careful how he uses this word. But he had broken teeth lined in this way, and had found a surprising accuracy of adaptation. If there was nothing more in the method than this one point, it would amply repay all the time and trouble necessary to learn all about it.

Dr. John S. Marshall, Chicago, speaking from the stand-point of the patient, would prefer Herbst's method in his mouth, because he didn't suffer as much as when the mallet was used. Dr. Herbst had filled two cavities in his mouth. The amount of pressure was considerable, about what would be used in condensing cylinder fillings. He found that after a while his jaws became tired because of the pressure, and he was obliged to support them. The motion of the burnisher produces a peculiar sensation. Several times when it came up against the walls the sensation was much as if the tooth had been broken.

Dr. W. H. Atkinson, New York, felt, when Dr. Bödecker first brought the Herbst method to his attention, that he didn't need anything but the mallet, and it took him a good while to comprehend that there was anything of value to him in this method. For hardness he knew of nothing in the way of a gold filling equal to one made by the Herbst method. Dr. Herbst had tried No. 120 gold, at his suggestion, and had succeeded perfectly; he had also used platinum-iridium gold and succeeded in making a good filling with it. Any dentist who is not successful in working it should go to one who is thoroughly indoctrinated with it, and, as Dr. Taft has said, he will catch many little points that have not occurred to him before. The rapid rotary motion, it was thought, would produce heat; but a peculiar twist of the wrist avoids it. He had felt the same as Dr. Marshall did; when the instrument passed the gold it seemed from the sensation that it slipped a little. He advised all to try the method thoroughly.

Dr. F. H. Rehwinkel, Chillicothe, O., received his first intimation of the Herbst method about three years ago, from the report of a clinic in the *Deutsche Monatsschrift für Zahnheilkunde*. He became much impressed and began to experiment. He commenced with tin

foil, and after a while was able to produce a filling almost anywhere. He then wrote to Dr. Herbst, and in a few weeks received a number of specimens showing the development of the method, from which he saw that he was not far wrong in his experiments; but the greatest difficulty was the uncertainty as to whether it would make a durable filling, such as we should wish to insert. He was much surprised when Dr. Herbst arrived in this country to see the great improvements made in the method since he first knew of it. If it should be used only for the lining of cavities, especially for amalgam fillings,—it produces the same results as the Blount method in one-fourth of the time,—he thought Dr. Herbst had given to the profession a method that would be of great benefit.

Dr. Bödecker. Some of the principles involved in this method have been misapprehended. One of the principal points is the conversion of every cavity, no matter what its shape, into one with four walls,—by the use of the matrix where necessary. Many different kinds of matrices are used by Dr. Herbst, and most of you have seen them. The cavity is prepared the same as for any other method of filling. After the cavity is prepared and the rubber dam and matrix adjusted, take a few large cylinders of gold, from three to five, introduce them into the cavity with the pliers or by any means desired, and with a Herbst hand-bur as large as the cavity will admit press it down. If the gold lies quietly, go ahead with the engine-bur and burnish tightly to the walls. If the cavity is round and with no undercuts, the cotton is used first, as stated by Dr. Taft. Agate points are best when the cavity will admit them. The point, which is pressed very tightly against the gold with the engine running not very fast, must be moved around the cavity from one side to the other. Then an exploring instrument with a very fine point passed over every part of the gold just put in, will show if any portion has not been perfectly condensed. Of course, any imperfections are corrected and more gold is conveyed to the cavity. When agate points are used it is better to slightly roughen the surface of the gold already condensed to make the next layer adhere more perfectly. If steel points are employed the roughening is unnecessary. For the last layer it is better to use heavier numbers of gold, as the very light foil does not wear so well as the heavier kinds. He had last year called Dr. Herbst's attention to the fact that the surfaces of fillings finished with the light foil became rough, and he now uses No. 30 foil on the grinding surface. Hand-pressure is used only to put the gold in place. A point made of garnet is used upon the side, and it is surprising how hard the surface becomes under it,—so hard, in fact, that the ordinary shellac and corundum-stone sometimes refuses to take hold to finish it off.

Dr. C. N. Peirce, Philadelphia, was satisfied that the results attained by the Herbst method make it of the utmost importance to the profession,—not to the older men, but to the younger element, who will be able to get much out of it. Dr. Herbst has been working at his system for seven years, and it has only been within the last six months that he has been able to perform satisfactory operations in certain cases, which made him willing to go abroad to show his method. The speaker had performed a number of experiments to show how well the gold was condensed, and in every operation he was struck by the perfect adaptation of the gold to every inequality of the walls, however slight.

Dr. S. C. G. Watkins, Mont Clair, N. J., wished to say one word in regard to the solidity of a filling put in by this method. He believed the first tooth filled on this plan by Dr. Bōdecker was in his mouth three years ago. The gold was packed with bloodstone. Any one who wishes can see the filling. For himself he was perfectly satisfied with it.

Dr. Lyman C. Bryan, Basel, Switzerland. The Herbst method has been tried in Europe, and there is a diversity of opinion as to its merits. Various devices have been tried for matrices, the necessity for which was the great stumbling-block of the method. There is sometimes great difficulty in getting matrices to go around certain cavities and pass between the teeth in certain positions. He himself used the preparation of steel used by clockmakers to support pendulums. It is only one-twelfth of a line thick; is in reality as thin as paper, and can be cut with the scissors. If you want it thicker at any point it can be lapped and soft-soldered. Matrices made of this very thin steel can be put wherever silk can be. The Herbst method is yet in its infancy. In Europe a great many have tried it, and many condemn it.

Dr. J. N. Crouse, Chicago, was more pleased with the specimens showing the ingenuity of Dr. Herbst in conquering little difficulties than with his method, to which he was not yet a convert. He confessed that he was probably harder to convert than the average man, but when he got there he stayed longer. He thought that extravagances had been indulged in by some of those who were enthusiastic over the method,—for instance, by Dr. Bödecker when he said that gold condensed with a garnet burnisher was so hard that corundum would not cut it. That means that it was harder than glass, which he doubted. He proposed to try the method. He was glad to have seen Dr. Herbst and his very ingenious methods, but he would be sorry to have to learn to fill teeth over again. It takes ten or fifteen years to do that, and he had hoped by that time to retire. The matrix was the part which he specially disliked about the method. He be-

lieved the use of the matrix was proper in approximal cavities or in-contour work, but frequently there is difficulty in applying the matrix, so that in his judgment it should be used only where necessary. Many men would occupy more time in adjusting a matrix than they ought to take in filling the tooth. So far he had not seen an operation done by this method that was equal to the best that were done by the older plans.

Dr. W. H. Morgan, Nashville, Tenn., wished to speak of two or three points. We are comparatively in our infancy as regards the science of metallurgy; and there is very much about gold that we don't know yet. In his earlier years he went among gold-workers a good deal, and he there learned that no man claimed to produce uniform results. A gentleman who had used soft gold as long as the speaker did learned that gold was hardened by friction when there was no condensation. He was positive that the solidity of soft gold fillings was due to the friction on the surfaces of the cylinders as they were put in. Take a cavity on the grinding surface of a molar, and fill it with gold by any method you choose. The mallet will condense the gold somewhat; but if you turn the instrument so that it will slide along the surface you will get a result that is impossible by the direct blow. He simply guessed at it when he suggested that there might be some electrical action in the Herbst method. The principle seemed very valuable, and one to which the energies of the younger men might well be devoted.

Dr. James Truman, Philadelphia. One point seems to have been lost sight of, and yet it is of vital importance. He alluded to the obtundent which Dr. Bödecker had mentioned. To his mind it seemed that it would be productive of very great injury if its use were persisted in. If we use an escharotic on a sensitive surface we destroy that surface. If it is used in a cavity the central portion of which is simply a prolongation of the pulp, we destroy the pulp-tissue to that extent. If we can destroy the pulp with oxychloride of zinc, why not with sulphuric acid? He was surprised at the indorsement which this obtunding agent had received. Dr. Taft's remarks showed that it caused disintegration. Eventually, he thought, it would end in destroying the pulp-tissue. In regard to Dr. Herbst and his method, he had learned of them from the German dental journals two years ago. He undertook to practice the method experimentally, but it was a failure in his hands. When Dr. Herbst arrived in this country he was among the first to see him demonstrate his method. He then again went to work with it, and within the last two weeks he has become satisfied that he could place fillings with it as solidly as he needed them. He had criticised Dr. Herbst's monograph severely in the Dental Cosmos, and he felt

that he had something to take back. He did not know that everything that its author claimed for the method could be done by it, but it certainly has strong merits.

Dr. E. A. Bogue, New York. What is the Herbst method?

Dr. Bödecker thought he had defined how the method was worked and what it did. It is nothing else but putting some gold into a cavity, first adapting a matrix to give the cavity four walls (which is not so difficult. It can be done in a half minute on any of the teeth as far back in the mouth as the first molars, back of which it is somewhat difficult). A portion of gold is then put into the cavity and condensed with a rotating burnisher; then with an explorer see that the gold is thoroughly condensed. If portions are found not packed as hard as they should be, put in some smaller pieces and condense again; and so on to the close of the operation.

Dr. Rehwinkel. Dr. Herbst was modest enough to disclaim the name, preferring rather that it should be called the German method. Formerly every new idea in operative dentistry came from America, and he finally thought that something should originate in Germany, and he determined to invent a method which should be recognized as distinctively German. His knowledge of gold led him to think something of this plan, and then it grew from experiments. He found that he would not get recognition in America unless he could produce a contour filling by his method, and that was the origin of the matrix. The rest of the process was a gradual growth.

Dr. A. O. Hunt, Iowa City, Iowa. Most of us away from the seaboard have little opportunity to observe the methods brought over from the other side, and some of us at least would like to hear from Dr. Perry.

Dr. Bogue stated that he had asked the question, "What is the Herbst method?" because the principles underlying it had been scarcely touched upon. Dr. Morgan was the first speaker to touch upon them. The Herbst method takes the speaker back to the principles taught him by Dr. Westcott: the results of packing gold with sharp-pointed instruments are not the same results as are produced by burnishers. We find this man from Germany going through the same work and bringing out the same results that are wrought by the more dextrous of our operators. The Herbst method is simply a convenient and accurate method of adapting gold to the walls of a cavity. The speaker had spent a good deal of money in perfecting separators. Dr. Herbst takes a thin matrix and squeezes it in between the teeth where silk would hardly go. Have we been able to so adapt gold to the walls of the cavity as to bring it into exact contact at all points? The speaker after watching Dr. Atkinson fill with cohesive foil and the mallet had gone home and filled a cavity by that

method in an hour and a half. He then filled a precisely similar cavity with soft gold and hand-pressure in twelve minutes, and the soft gold filling was the better adapted of the two. If one can so adapt soft gold as to show every inequality of the carnelian of a ring against which it was impacted, it would seem that he could equally adapt it to the corners of a cavity. One word about matrices and contour operations. The speaker has not yet got over the impression that we have no right to mar the natural form of a tooth. To him it seems almost sacrilege, and he was delighted that a simple means had been found which would throw our separators overboard. We are going to be able to put those fillings in with more rapidity and accuracy, and if we can say to patients after their teeth are filled, keep them clean or take the consequences, we shall make a decided advance. He had seen patients from over three hundred of his confrères, and he also knew his own failures in this regard. Earnest and honest instruction in regard to taking care of work done will help to preserve it; and earnest and honest work is better than a slipshod makeshift. Carlyle has said that genius is an unlimited capacity for hard work. Dr. Herbst, he thought, was a genius, and ingenious, too; he knows that the principles upon which his system is founded are as old as the hills.

Dr. S. G. Perry, New York, had not had sufficient experience with the Herbst method to discuss it at all; but should it not prove to be what its author hoped, should it even prove a failure as a method of filling teeth, we should still be indebted to Dr. Herbst for the special preparation of gold with which it has been so intimately connected. We are under obligations to him also for his example of generosity and modesty. He came here with the distinct determination that if his method proved a failure he would give it up. Stress should be laid upon one point in connection with the matter. Dr. Herbst is distinctly entitled to credit for the rotary motion which he introduced.

Dr. Thos. Fillebrown, Boston, Mass. It would seem from the remarks that have been made that the whole case was the mallet against the Herbst method; that there was no intermediate ground. He wanted it to appear that there is a large number of dental practitioners who ignore the use of the mallet; that is, a large number who were users of the mallet for years, and as ardent supporters of it as any, who when another method, which did the work as well in a less laborious manner, was introduced, left the mallet and became as enthusiastic in support of the newer method. By the use of the cohesive property of gold and hand-pressure fillings can be made durable. Fillings so made will endure as well in all respects and stand the tests to which fillings are subjected as well

as any fillings. Some of these which the speaker had put in are as firm and strong at the end of two years as ever. Such facts prove that these things could be done if you don't use the mallet or the Herbst process, and by a method that would beat the mallet in the amount of time required, and would also beat the Herbst process, he thought. The cohesive quality of gold is not thoroughly understood—not enough at any rate to trust it under all circumstances. All that the condensing force is used for is to bring the surfaces of the different pellets or cylinders into thorough contact; and only enough force is required to break down the angles. You don't want to hammer the life out of the gold, and that is just why the rotation method is valuable. He did not believe that any man had before ever thought of or applied the method, which had been so well demonstrated here. When he thought of Dr. Herbst, take him as a whole, he was impressed with the idea that a good many of us will have to take a lower seat than he deserves. He wished to return his thanks to Dr. Herbst; he had received a great deal of benefit, and he should go home and try the method.

Dr. Taft wished to explain with reference to the extreme caution of Dr. Truman regarding the obtundent before spoken of. He had simply spoken of some experiments he had made with it and of its action. Dr. Herbst had stated that he had used it for five years with no untoward results, and the results in the speaker's hands were uniformly successful. Sulphuric acid was not so violent an agent as Dr. Truman's language would lead those unacquainted with it to believe. It has been used for many years in alveolar abscess, and if it were so violent in its action as he says it could not have been used there. It is an escharotic and does destroy the tissue on the immediate surface, but its life-destroying power ends there. The speaker could not conceive that it was likely to do the damage that Dr. Truman's remarks would indicate.

Dr. Bogue had found veratria of very great assistance in obtunding sensitive dentine. The preparation which he uses consists of absolute alcohol, 6 minims; veratria, saturated solution; carbolic acid, equal volume of the above two; and glycerin, 6 minims.

Dr. Truman wished one word in reply to Dr. Taft. Living tissue is of such a nature that you cannot place so powerful an agent as sulphuric acid in close contact with it without risk of destroying the tissue. Another point that should be borne in mind is that the teeth of the German race are denser than those of Americans, which may make them more tolerative of destructive agencies.

Dr. Bōdecker, when in Bremen, was still doubtful about the safety of the obtundent under discussion, and Dr. Herbst had taken him to see some of the patients in whose mouths it had been used. He

found some very delicate teeth that under no circumstances would he fill with gold. When this obtundent was applied the teeth stood better with gold than with anything else. He saw three of these teeth, in one of which the pulp was exposed and was yet alive. The sensibility of the filling after the use of the obtundent is not great.

Dr. Morgan. In using obtundents we ought to know just what we are doing. He was not enough of a chemist to know if this preparation was a new compound, but he did know of some of the obtundents that their action was not self-limiting. We ought to know the nature of the component parts, and of the compound itself; whether it acts at once and exhausts its powers, or whether its work will be continued for months,—when and how it acts,—and we must not go beyond our actual knowledge. When we use an agent of which we do not know the characteristics we are groping in the dark, and years may elapse before all the mischief is done.

Dr. Truman W. Brophy, Chicago, had known of many obtundents introduced to the profession since he began practice, which had been abolished from dentistry simply because they were escharotic, and any agent which obtunds by escharotic action does so at the expense of risking pulp-devitalization. Unless some one who knows is prepared to say just what this new obtundent is and what it will do he did not want to use it. There was not a dentist present who had not seen pulps devitalized by agents used for obtunding sensitive dentine.

Dr. Taft replied that he had stated what the agent was, and he had tried to state the nature of its action. The sulphuric acid dissolves the surface of the dentine, forming sulphate of lime, which is insoluble. The cocaïne is used as an obtundent for the pain that would otherwise be caused by the action of the sulphuric acid. The effect does not reach beyond the line which bounds that action.

Dr. Truman. What becomes of the fibrillæ?

Dr. Taft. They are only affected as they reach the line of action.

Dr. H. A. Smith, Cincinnati, thought that a combination of chloride of zinc with cocaïne might be useful as an obtundent, as it would be self-limiting.

Dr. Atkinson wished to state that no one had yet determined whether the obtunding agent under discussion was a compound or a mixture, and until we know this we are dealing empirically when we use it; but he couldn't see why one should refuse to be healed empirically. Chlorine is not self-limiting. Of all things it operates illimitably. Arsenic is not self-limiting. Its action goes on for years. Nitric acid is an example of a self-limiting agent.

The president then announced that a photograph of the members of the association was to be taken shortly after adjournment.

After the organization of the sections, adjourned to 8 P. M.

(To be continued.)

SOUTHERN DENTAL ASSOCIATION.

(Continued from page 571.)

Second Day—*Morning Session.*

The association assembled, July 28, at Amusement Hall, Broad street, Nashville, Tenn., and was called to order at 10 A.M.

The Executive Committee reported a further list of applicants for membership, and, as before, the secretary was directed to cast the ballots of the association for the whole, five in number.

Dr. H. E. Beach, Clarksville, Tenn., was restored to the roll.

The subject of Dental Education being recalled, Dr. W. H. Morgan introduced Professor Hubbard, dean of the medical and dental departments of the Central Tennessee College, who addressed the association on behalf of that institution. For several years there had been a demand for the education of colored young men for the practice of dentistry. The proper facilities had now been secured, and the dental school would be opened in October next. The medical department had been in operation ten years, and its sixty-two graduates were now practicing medicine successfully, most of them in the Southern States. They had been kindly received by resident physicians wherever they had located. The dental school would have the usual curriculum of dental colleges, and it was proposed to connect it closely with the medical department. There would be rigid examinations, and in case of failure the student would be required to repeat the course. As in most colleges, the term would be two years; but if the time was found insufficient it would be extended. It was intended to make the work in dentistry as thorough as it is in medicine. The faculty would not put their names to a diploma unless it was well deserved. The cost of tuition would be considerably less than in the majority of dental colleges.

In answer to a question, Professor Hubbard said that white students would not be sought for, but would not be refused. He bespoke for the future dental graduates of his college the same kind reception that had been accorded to the medical graduates. His remarks were heartily applauded.

The subject of Dental Education was passed, and the Committee on Hygiene called.

Dr. B. H. Teague read a paper on "Personal Hygiene," of which the following is a synopsis:

In the early days of American dentistry men in delicate health, or not naturally robust, were advised by physicians to betake themselves to the dental profession as a health-giving avocation. Nor was this advice given without good reason, for it is within the recol-

lection of men now amongst us that itinerancy was then the rule in practice, the few operators who were well established in their offices being found only in the largest cities. The exercise and change of air and diet secured by the traveling dentist exempted him from those deleterious influences which rendered the life of a busy city dentist anything but healthful. But the advent of the rubber dam, perfecting the manipulation of cohesive gold foil, and of the rubber base, driving many from the laboratory to the operating-room, together with the influences exerted by dental associations, colleges, and dental laws, which evolved the mechanic and quack into the artist and scientist—all this has so changed the manner of practice as to make dentistry a calling fraught with much danger to the health of him who pursues it. Ailments of the stomach, liver, lungs, and the nervous system are the abnormalities to which the dentist is most liable. Fresh from the open air of school or college days or farm life, the young dentist begins a confined and sedentary existence with the appetite of an athlete. This is indulged without restraint until dyspepsia or biliousness becomes frequent or periodical; many then resort for digestive aid to bitters, preparations of pepsin, or the stimulating toddy. Conscious of his strength and full of ambition, the young practitioner stands manfully at the chair through long hours of weary labor, exhausting muscles and nerves in the attainment of superior dentistry and golden reward. The necessary open air exercise is soon neglected from sheer inability to take it. An hour or two spent on a lounge, with a quietus for the nerves in the shape of a strong cigar, is the substitute now taken to restore the natural vigor of body and mind, followed, perhaps, by the burning of midnight oil in reading the current literature, recording, composing, or experimenting. A few of the "wee sma' hours" are allowed for repose, until the curse of sleeplessness is gradually imposed, and life becomes a burden. This is the history of many a man in our profession. If not the busy practitioner, nor the bookworm, nor the scientific investigator, he is probably the average ordinary toiler who battles with life as he finds it, indulgent to his appetites, and indifferent to the care of self; one day doing the labor of two at operating, over an unsuitable chair, with bent back and compressed viscera, in a bad or unsteady light; the next day exerting great muscular force at the lathe in an overheated and unventilated laboratory.

As a rule dentists do not take care of themselves. Many are indifferent; others do not know how. We must not give up the exercise to which we have been accustomed; the vigorous walk, the horseback or bicycle ride, the exercises of the gymnasium should be daily practiced as a duty. Probably the best way to

regulate daily exercise is to have one's residence a mile or more distant from the office. If one is a rigid disciplinarian it would be as well to live in a house with office attached, taking the constitutional walk out of doors when the weather permits, and when the weather forbids pacing the hall in-doors; but, fair or foul, out-doors or in-doors, the daily walk should be taken.

It is harmful in sedentary life to continue early habits of free eating. A moderate breakfast, good dinner, and very light supper is the safest rule, allowing ample time to eat. Mid-day lunches and night-time dinners are mistakes. When daily exercise is prevented food should be taken in limited quantities, in order to regulate the supply of blood to the proportion of waste. Nature warns us by diminishing the appetite that the supply of food exceeds the demand. It is then the height of folly to resort to tonics, especially alcoholic tonics, to stimulate the desire for food. The sense of fullness after a hearty meal induces the indulgence of smoking, and soon the tobacco habit grows stronger, if not already fastened upon one from early youth. What a condition, then, is the person of the operator in to approach a delicate and sensitive patient! Indeed, it is not surprising that sometimes a patient deserts a competent dentist for a dude of a fellow who keeps himself sweet and clean. Above all people, the dentist should be the patron of the tooth-brush, the mouth-wash, and the bath. Prophylactic measures should be employed to ward off ailments. Arm-rests to support the uplifted arm and prevent nervous tension and overwork of the heart; operating stools to secure a sitting posture whenever possible, thus avoiding bending of the body and hanging of the head, from which deleterious habits result lung troubles, intercostal neuralgia, and vertigo, to say nothing of hemorrhoids and varicose veins, which result from habitual standing.

The dental engine should be worked by some power other than the foot, otherwise one leg is in time rendered almost powerless by non-exertion, and the other is injured by overwork.

The care of the eyes is peremptorily demanded. For a steady and the least variable light, the speaker has found a northern outlook the best, with the skylight overhead. The walls of the operating-room should be neutral in tint, such as a light pea-green or delicate blue; never, under any circumstances, of a glaring or sombre hue.

A system of appointments whereby short sittings for patients are secured is necessary to rest and recuperate the strained parts. Slippers or easy-fitting pumps on the feet, a fan worked by power, or attached to the end of the engine-arm, are suggestions of ease and comfort. A few weeks of recreation and relaxation during the hot season, including a dip in the sea, or a breath of mountain air,

are almost indispensable. It is no less important to cultivate an equipose of mind and serenity of temper, to insure which the best rule is to be temperate and regular in all things.

Dr. Geo. H. Winkler thought the essayist might have said more on the subject of motors. Water-power is not reliable everywhere, and electricity, while very delightful when efficient, is very troublesome to keep up. The best motor after all was a big strapping negro. He used one with his suspension engine. Occasionally, in very delicate operations, if he wanted complete control of the engine himself, he could easily dispense with his motor for a short time; but for general purposes the negro motor is unequaled. As to keeping cool, he had some years ago rigged up a fan, somewhat in the shape of a steamboat propeller, which kept himself and patients cool and comfortable for years; but, as will happen sooner or later with such devices, it induced rheumatism in the neck and shoulder, which was very difficult to get rid of.

Dr. Teague indorsed Dr. Winkler's fan arrangement as a splendid invention; also his motor, which he, too, had used. The only objection he had found to it was that in warm weather it was apt to be too powerful.

Dr. W. H. Richards, Knoxville, Tenn., believed that active exercise, if at all laborious, was not conducive to digestion. He instanced the case of two dogs which were fed a hearty meal at the same time, one being taken away immediately to the chase, while the other was tied up in the kennel; and, upon being killed, the dog of the chase was found to have his meal intact in the stomach, while in the other dog it was entirely digested. He would recommend a light lunch at noon when work is to be done in the afternoon.

Dr. R. B. Adair, Gainesville, Ga., said he had found a southeastern light the best to work by, but he was of the opinion that dentists often had not light enough in their rooms, and worked too much in the shade.

Dr. J. Hall Moore, Richmond, Va. The southeastern light is the worst, in my opinion. In the morning it is very light, and wearies the eyes; then it gets poorer all day, requiring change of glasses, or something else, to strengthen the muscles of the eyes. A good northern light is the best and most uniform. For six years I have used the Babcock motor, and the relief it gives is worth ten times the cost every year. But any motor that takes the place of foot-power for the dental engine will add from five to ten years to a dentist's life. I have also used the Backus water motor, and think there are some turbines better than the Backus, consuming less water.

Dr. W. H. Morgan was very glad to hear this discussion, because

these subjects were not receiving sufficient attention. Years ago, in conjunction with the late Dr. Samuel S. White, he had offered a prize for the best essay on these topics. A large number were received, but they were all too general in their scope, and we did not find one that related peculiarly to the dentist. He would take exception to the fallacy that it is not well to eat at night. What are the indications of nature in this respect? The infant goes at once to sleep on its nourishment. The whole animal creation exhibits a propensity, after eating, to seek a place for rest and sleep. Regular habits and prudent eating are necessary for everyone's health, but cast-iron rules will not fit everybody. The best light in the world is the sky-light. With this it does not matter where you face. You can direct it into the mouth of your patient; it is easily regulated and always at command. Light from the rear is always bad, and should be shut off. The best motor is an intelligent assistant, man or woman; I decidedly prefer the woman. She gives the best help for yourself and your patient. She is preferable because she looks at the right end of the mallet, while a man looks at what you are doing. A woman is greatly preferable to a young man, a student, or an old man; she is quite an addition to our offices, keeps house for us, and renders important services to lady patients which a man knows not how to render. An intelligent assistant is almost a necessity. He or she is easily directed to turn fast or slow, to remove or replace instruments, to do anything required, by a mere look, or motion of the head or hand, without opening your mouth; and, with experience, they soon learn to anticipate your wants.

Dr. E. S. Chisholm, Tuscaloosa, Ala., finds the southern light, properly protected, far better than the northern. A room with southern exposure is cooler in summer and warmer in winter, and an up-stairs room is preferable to one below, being much less liable to malarious influences. He uses a small stool, the seat of which is about the size of a hat-crown, for securing a sitting posture at the chair, and finds it very comfortable and convenient. The change from a standing to a sitting posture is very important. He employs a female assistant, and finds her neat, handy, delicate in touch, and self-possessed. Has also used the colored motor, but not with satisfaction.

Dr. McKellops believes in female assistants. They keep the office and instruments neat and clean. Cleanliness is next to godliness in dentistry as in other things. He had some instruments now in use thirty years old, which had been preserved by being kept clean. The doctor read some extracts from a druggist's book of circulars, containing much valuable information on the subject under discussion. He particularly recommended peroxide of hydrogen and menthol as disinfectants for the office, and he exhibited a small

spray apparatus, devised by Dr. Eames, for using a preparation of peroxide of hydrogen and chlorine. Chlorine, he explained, was believed to have the power of destroying the deadly poison of canine rabies.

Dr. G. W. Rembert, Natchez, Miss., said that light, ventilation, disinfectants, motors, etc., were all very well to consider, but there were other indispensables in the matter of hygiene. He had learned a good deal by thirteen years' suffering. The northern light was the most satisfactory. He uses a male motor and assistant, and thinks trained assistants should be used to do everything. The great trouble has been in too many hours' daily work, without system, resulting in poor digestion and mental worry. He has systemized his time to six hours daily, with no variation except for extraction. Exercise is indispensable, but should not be excessive; the best is a morning stroll or horseback ride, or both. He corroborated Dr. Morgan's remarks as to evening meals, and would also emphasize the importance of sociability and a happy condition of mind.

Dr. Geo. Chisholm, Columbus, Miss., did not think it practicable to formulate a set of rules for all practitioners to live up to. Each one had his own difficulties, and was more or less the subject of circumstances. He did not believe in having fans at work with the windows closed; the outside air should be let in freely at all times. Hydronaphthol, or permanganate of potash, were the best disinfectants for the office, placing a little in the spittoons and other vessels, and washing them out after a few operations. He uses a young man for a motor, who knows what is wanted, knows when the operation is done, when to clean the instruments, etc. No light is equal to that obtained from a southern exposure, which may always be well regulated by blinds. The objection to the sky-light is that the shadows of the clouds often interfere with its uniformity.

Dr. W. C. Wardlaw called Dr. Catching to the chair, and took the floor to make some remarks on the subject. One important hygienic measure which he had adopted with satisfaction in operating was the use of a mouth-glass with the left hand. He can throw the light on the spot he wishes to see, and plugs or cuts away the tooth without seeing it, by merely looking at its reflection in the glass. By this means he escapes the exhalations of the patient, and is not contorted or bent over his work. This method is a little difficult to acquire, but the relief afforded is well worth the cost. He has found the sky-light superior not only for light, but for ventilation, being easily controlled by a cord. His patients constantly commend it.

Dr. R. R. Freeman, Nashville, Tenn., said he would like to emphasize strongly the importance of sitting down frequently while at the chair. The heavy iron stools sold for the purpose are not convenient. He uses and would recommend a common office or

counting-house stool, which may easily be moved into position or out of the way by the foot. The use of this has cured him of sciatica. He also heartily indorsed the statements of Dr. Wardlaw with reference to the comfort and convenience of operating by means of a glass.

The subject of Hygiene was passed. Adjourned to 3.30 P.M.

(To be continued.)

NEW YORK ODONTOLOGICAL SOCIETY.

The New York Odontological Society held its regular monthly meeting in the parlors of the Academy of Medicine, No. 12 West Thirty-first street, Tuesday evening, June 8, 1886, at 8 o'clock.

The president, Dr. E. A. Bogue, in the chair.

The President. As there are no Incidents of Office Practice to be presented, I will refer briefly to a case which our former confrère, Dr. Rosenthal, of Liège, Belgium, has recently had under treatment. Dr. Kingsley has kindly consented to place upon the blackboard a diagram illustrating the appliance used. Dr. Rosenthal amputated a portion of the lower jaw of a lady thirty years of age, the part removed extending from the cuspid back to and including the ramus of the right side. After the amputation the muscles drew the jaw so far out of place as to cause dislocation upon the left side, the chin practically disappeared, and the patient being unable to masticate was nourished upon liquids. Dr. Rosenthal designed a fixture of gold in two parts, one portion being firmly attached to the back teeth of the upper jaw, left side, the other part being secured to the lower bicuspids of the same side. To the lower portion was attached a curved tube, into which fitted and played an arm from the upper part of the fixture. This appliance restored the lower jaw to its proper position and made mastication possible, the only drawback being the lack of any lateral motion of the lower jaw.

Dr. N. W. Kingsley represented upon the blackboard the apparatus devised by Dr. Rosenthal, and added a few words in explanation of its construction and application.

The President. The secretary will now please read a paper by William Herbert Rollins, M.D., D.M.D., of Boston, upon

Regular Examinations of the Saliva.

Having several years ago written a paper on this subject, an excuse is needed for taking up your time with a matter which is not new. Frequently patients come to me to have enamel fillings inserted in the anterior surfaces of their teeth, and when I ask what instructions their dentists have given them, they usually say that they have been told there was nothing which would check the decay except to fill with

gold as soon as the cavities were large enough. If I ask whether any directions were given about taking any constitutional treatment, or if any examination of the secretions of the mouth had been made, they reply that nothing of this kind has occurred. Unlike caries, these lesions are primarily due to acid in the secretions of the acinus glands of the lips which are affected with ptyalorrhea. I think that if the dentist has decided that nothing could be done in such marked cases as these, he has probably been equally unfaithful about attending to the other secretions of the mouth.

This, then, is my excuse for bringing the matter before you now.

Since Miller brought order out of chaos, most of us believe that acids produced by fermentation are the cause of decay. And yet there are persons in whose mouths no decay exists, although this same production of acid must be going on.

Leaving out of account, for a moment, the difference in resisting power of teeth, and also the amount of care used to remove food, we must seek in the oral fluids for the causes of this difference. It has been stated that acid eructations from the stomach are a cause of decay, but I do not think this a factor of importance. Saliva has many functions, the most important of which is its protective action on the teeth; for when saliva is normal it is difficult for teeth to decay. It prevents decay in two ways,—first, by washing away the acids formed in fermentation; second, by combining with these acids, making them harmless. Normal saliva is alkaline, not neutral, as has been many times stated. A neutral or acid saliva in man is pathological. These facts cannot be too strongly emphasized. For a short time, early in the morning, the saliva may be acid, but this is due to carbonic acid, and soon disappears.

I have tested the saliva in many cases where the teeth were decaying rapidly, and have always found an acid reaction; or, to be more precise, the secretion of some of the glands has been neutral, and of the others acid. It is evident that in such cases the saliva cannot neutralize the acids formed in fermentation. The most it can do is to mechanically dilute these and wash them away. To allow such a condition as this to exist shows almost criminal neglect on the part of the dentist. This is particularly true in cases of children, who are usually placed absolutely under our care, and who need the most careful attention in this direction. What is the use of filling their teeth with gold and doing nothing to prevent renewed decay?

This brings us to the matter which forms the heading of this paper,—the necessity of regularly examining the reaction of the secretions of the mouth. The reaction of the oral fluids must be kept alkaline. To accomplish this it is necessary to teach the patient to test his saliva at short intervals, and if it is acid or neutral he should

take the remedies found best in his case. Sometimes it is only necessary for him to work or study less and take a little more fresh air. In most of the cases local treatment will not do, constitutional remedies being required. To use these understandingly is often difficult, as it is hard to find out the particular cause of the trouble. While trying to do this we can treat the symptoms by giving alkalies, which are most efficient in the form of mineral waters. It would seem easy to test the saliva with a piece of litmus-paper, but, like every observation, it requires a little skill.

In closing I should like to relate a case which illustrates this point, and at the same time is interesting as bearing on the amalgam question. An eminent physician wrote to me that a patient of his, who was also a patient of mine, was suffering from salivation, for which he could find no cause. He wanted to know if this salivation was not caused by an amalgam filling which I had placed in a tooth. The patient confirmed the statement about the salivation, which she said was excessive. Upon examination I found the saliva markedly acid, while only a few weeks before it had been normal, and several teeth had been softened at the necks in that short time. I did not find any increase in the amount of the saliva on this examination, but its acid condition was explained to the patient and a prescription given her. I saw the physician a short time after this, who said he had tested her saliva, and finding it not acid, he had advised her not to use the prescription. I saw the patient the same day, and again found the saliva very acid. The rubber was applied and the teeth prepared for filling, the operation lasting an hour and a quarter. During this time the amount of saliva secreted was only six drachms,—and this, too, under the stimulus of excavating sensitive teeth. This could hardly be called a marked case of salivation, even if there was an amalgam filling in the mouth.

The President. Gentlemen, Dr. Rollins's paper is before you for discussion. The subject is one that was brought up by Dr. Chase, of St. Louis, before the American Dental Association, many years ago, and is a very important and interesting one. If the gentlemen are not ready to discuss the subject now, will Dr. Weld have the kindness to read the paper he has prepared for the occasion?

George W. Weld, M.D., D.D.S., of New York, read a paper on

The Destructive Energy of the Tincture of the Chloride of Iron* on the Teeth—An Experimental Study.

Of all the heavy metals, it has been generally observed by chemists that iron is the least noxious. In the domain of therapeutics,

* Synonym: Tincture of the muriate of iron.

as a remedy it has for many years held a prominent position. It is one of the essential elements which is frequently found deficient in the *organism* of man, and which as a restorative agent is utilized by a majority of the physicians throughout the civilized world. Chemical analysis has demonstrated time and time again its constant presence in considerable quantity in the blood and hair, and in small quantity in the gastric juice, chyle, lymph, and in various other tissues and fluids of the body.

According to Gorup-Basanez (analysis of C. Schmidt), the blood of man contains 1 part of iron to 230 parts of red-blood globules, and that of beef 1 part of iron to 194 of red globules. Dalton* states that iron exists in hemaglobine, not in the form of a distinct oxide, but in all probability directly combined like sulphur with the carbon, hydrogen, nitrogen, and oxygen, which form the remainder of its substance. Bartholow † observes that iron performs a very important office in the rapid construction of red-blood globules, when it is administered in anemia. Without it, hemaglobine is not formed, and the red-blood globules diminish in number.

In health a mixed diet contains sufficient iron for all purposes of the economy; but in many forms of disease the blood is furnished with the material which it so much needs. The physiological action of iron, however, is not limited merely to the construction of red blood. When there is no intolerance to its presence in the stomach it promotes the appetite and increases the digestive powers.

By increasing the disposition for food and the ability to dispose of it, iron acts as a stomachic tonic. In fact, it is the opinion of a number of eminent authors that the chief use of iron as a remedy is to promote the digestive function. The same opinion is held regarding the simple and astringent bitters. The distinction generally made between the remedial effects of the iron and the bitters is that the utility of the latter is due more to its stimulative effect on the digestive function, and the retardation of the combustion process, than to any direct action on the blood.

But whatever the *rationale* of the remedial effect which iron seems to exert on the coloring matter of the blood, it can be of little, if any, practical importance to the dentist. Recognizing its therapeutical value, he is compelled to look upon the administration of some of the preparations as a necessary evil.

The questions which are most likely to interest him are:

1. What preparation of iron is the best to prescribe, or shall be recommended most?

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* "Human Physiology," by John C. Dalton, New York, 1882, page 97.

† "Materia Medica," by Roberts Bartholow, Philadelphia, 1881, page 108.

2. In what degree of destructive energy do the acid and astringent properties of iron act on the teeth during the process of ingestion?

3. What is the proper method of administration?

To render the subject as lucid as possible, the following table of iron compounds has been prepared for your consideration, a slight review of which will be necessary to a complete understanding of their respective merits, or demerits, so far as they may affect the teeth:

CHALYBEATES.

Bland.	*Astringent.*
Reduced Iron.	Sulphate (ferrous): Copperas.
Carbonate: Saccharated and Comp'd.	Iron and Ammonia Sulphate (iron alum).
Pills, and Comp'd.	Iodide (syrup, pills, and saccharated).
Mixture of Iron.	Bromide (syrup).
Phosphate.	Sol. Nitrate.
Pyrophosphate.	Chloride: Liquor and Tincture.
Oxalate.	Solution and Tincture of Acetate.
Lactate.	*Styptic.* (External use, local effects.)
Dialyzed.	Chloride: Liquor and Tincture.
Citrate.	Sol. Sub-sulphate. } Liquors.
Potassio-tartrate, and other tartrates and citrates.	Sol. Ter-sulphate. } Liquors.
Albuminate of Iron.	Sol. Nitrate. } Liquors.
Hypophosphite.	*Special Virtues.*
Valerianate.	Tr. of Chloride.
	Antidote for Arsenic.
	Hydrated Oxide.
Disinfectant.	Dialyzed.
Sulphate (ferrous).	The latest reports from the American Public Health Association show copperas to be a disinfectant no longer.

By a casual glance at this list, it is at once apparent that the number of the bland preparations far outnumber those preparations which in their composition are held to be both acid and astringent, and which affect the teeth so disastrously.

Naturally, then, the query presents itself to the mind of every practical dentist, Why are not these preparations which it is claimed exert such a pernicious effect on the dental organs excluded, and the bland ones substituted? It will be observed on again referring to the list of iron compounds that the tincture of the chloride of iron, which by many dentists is looked upon with so much disfavor, is classified as being possessed of special virtues.

The question of utility in the choice of the various preparations of iron often becomes necessary when the physician is called upon

to prescribe them. There is also the matter of cost to be considered. Some of the preparations of iron,—such, for instance, as the citrates and tartrates,—although perhaps equally as efficacious in some cases, are more expensive than the patient can afford. Then the use of iron is frequently determined by a careful differentiation of the causes; the idiosyncrasies of each individual patient have always to be considered by the physician whenever its use is indicated.

The number of the preparations of iron generally used by physicians varies from one to fifteen,—the tincture of the chloride probably being the one most extensively used. Next in order as regards popular use may be mentioned the carbonate, the citrates and sulphate, dialyzed, the iodide, and the reduced iron. The albuminate, pyro-phosphate, phosphate, bromide, acetate, valerianate, and hypophosphite are used more or less according to the stand-point of merit or demerit as viewed from clinical observation made by each individual physician.

Of the fifteen preparations above mentioned, it may be said that the only ones which can exert an injurious effect on the teeth at the time of ingestion are those which are administered in the form of a solution, of which may be mentioned the tinctures and the syrups of the other forms, to which I have alluded.

Brief mention, therefore, will be made of the balance of the iron compounds, which are administered internally, by means of pills or compressed tablets.

The first on the list is that preparation known as reduced iron, or Quevennes iron. This preparation is neither astringent nor acid. It does not injure the teeth, nor damage the stomach. The objection to this form of iron is that it is apt to contain too much hydrogen and oxidize on exposure, and when impure to give rise to eructations of disagreeable gases of a sulphuretted or phosphoretted odor. The effect of the carbonate and the carbonate saccharated, so far as the teeth are concerned, corresponds to the first form mentioned. The objection to their use is that they have a constant tendency to decompose into iron rust (oxide of iron).* Of the phosphates and pyro-phosphates, the latter is generally employed, and by some thought to be one of the best members of the group, being soluble and bland and not easily decomposed.

The next one of any practical importance on the list is the dialyzed (ferric oxide in solution). This is a non-officinal preparation of iron which does not blacken nor injure the teeth. When first introduced it was thought by many that it would prove to be the best form in which to administer iron, and afford a substitute for the tincture of

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* Bartholow's "Materia Medica," Philadelphia, 1881, page 106.

the chloride; but clinical experience has shown it to be inferior in many respects, and it has accordingly fallen into disuse.

The citrates and tartrates are used quite extensively. They are agreeable, bland, and for many forms of debility, when administered internally, produce very satisfactory results. The albuminate is a form of iron which of late has gained considerable favor with a large number of physicians. It is a combination of the sub-carbonate of iron, albumen and sodium, and is compressed in the form of a lozenge, or round tablet. It is considered the most bland of all the iron preparations, and is frequently prescribed for weak and nervous persons whose powers of assimilation have become very much enfeebled, and who are unable to take any other form of iron.

Miable contends that the albuminate of the peroxide of iron is found in the blood, and that this is the basis of the red globules, and it has been shown that the presence of an alkali forms the catalytic change, and that some of the iron salts—as, for instance, the ferro- and ferri-cyanides of potassium, and other double salts which are not precipitated by the alkalies—are absolutely inert as remedies, and pass unaltered from the body.

The hypophosphite of iron possesses a double medical value, and is as much a phosphorus as an iron compound.

The sulphate of iron (green vitriol), although possessing decided astringent properties, is nevertheless administered frequently for increasing the appetite and promoting digestion. It is contra-indicated when the stomach is delicate. It is often used in the preparation of the carbonate by decomposition with potassium carbonate, as in Blaud's pills.

The iodide is used principally as a specific in the treatment of anemia complicated with constitutional syphilis. If used in the syrup form it tends to blacken and injure the teeth.

The bromide, of which the syrup is officinal, was introduced for the purpose of combining the tonic effects of iron with the sedative action of bromine, but is not often prescribed.

The solutions of the nitrate, sub-sulphate and ter-sulphate are generally employed for external use, or for the local effect which they produce.

The tincture of the chloride of iron seems to have certain special virtues which the other preparations of iron do not possess; and notwithstanding its properties are extremely acid and astringent, it is frequently employed by physicians, not only in the treatment of anemia, but also in large doses in the treatment of erysipelas, neuralgia, coryza, diphtheria, epilepsy, acute rheumatism, and other diseases which might be mentioned. It acts also as a diuretic; even in ordinary anemia many authorities prefer it to any other prepara-

tion, claiming that its effects are shown much more quickly, and that it seems to act more satisfactorily. Almost all agree that it possesses special virtues, either constitutional or local, which render it useful in the above-mentioned disorders. These peculiar properties (especially the diuretic effect) are ascribed by some to a peculiar ethereal compound resulting from mixture of the liquor ferri-chloridi and the alcohol used in making the tincture, to which compound its odor is due.

At the very onset it must be apparent to the mind of every reflecting dentist that, whatever the virtues of the bland preparations of iron may be, the above preparation of iron possesses certain advantages and special virtues, and is most generally used at the present time, especially in dispensary practice, by a great majority of physicians. The complaints regarding the destructive tendency of this preparation of iron upon the teeth are as familiar to the physician as they are to the dentist. The direction, therefore, to the patients when taking this preparation of iron has always been to dilute with water,—a mode of administration, I will briefly say at this point, calculated, strange as it may appear, not to decrease but rather to increase its destructive energy on the lime-salts of the teeth.

The results of the experiments of Dr. Smith,* of Edinburgh, Scotland, are interesting both to the dentist and physician. Dr. Smith experimented with eight of the compounds of iron which at the time the experiments were made—about twenty years ago—were most generally used as remedial agents. These were the saccharated carbonate of iron, twenty grains to an ounce of water; carbonate of iron in the same proportions; syrup of the phosphate of iron and phosphate combined; the syrup of the iodide of iron and water, equal parts; the citrate of quinine and iron; the wine of iron; the sulphate and the tincture of the chloride of iron.† On examining the respective solutions after twenty-four hours the teeth were found unaltered in those of the carbonate, saccharated carbonate, phosphate, iodide, citrate, and the sulphate. In the solution of the wine of iron the liquid itself was somewhat turbid; the teeth, however, appearing to be untouched. In that of the chloride of iron, a turbid sediment filled the bottom of the bottle and covered up the teeth from view; the fangs of the teeth were somewhat soft and flexible and the enamel easily scraped down. The sediment under the microscope presented an amorphous appearance. In conclusion Dr. Smith further says that, from the facts obtained from the results of his experiments, it would appear that certain preparations of iron when directly applied do ex-

* *Edinburgh Medical Journal*, 1866, Vol. ii, page 631.

† The strength of the solution employed by Dr. Smith was one ounce of water to two drachms of the tincture of the chloride of iron.

ercise a powerful effect on the substance of the teeth; and the ratio of the effects obtained would seem to prove that, of all the preparations employed in these, that of the tincture of the chloride of iron acts more powerfully; the sulphate of iron next; and the next to that again, although in comparison very immaterially, the wine of iron,—the other preparations of iron appearing to be inert.

At a somewhat later period Dr. J. H. McQuillen, of Philadelphia, in speaking of the effect of this preparation of iron on the teeth, stated, in an article published in the DENTAL COSMOS,* that "a young lady, whose teeth, originally of excellent material, are now in the most dilapidated condition, informs me that she has taken the tincture of the muriate of iron almost daily during the last year. In her case not only the affinity between the hydrochloric or muriatic acid and the lime in the teeth has been fully demonstrated, but in addition the impropriety of an indiscriminate use of that valuable remedy. Employed, as this agent sometimes is, for a week or weeks, with the direction to 'take fifteen drops every two hours in a little water,' without any caution or corrective against its deleterious influence upon the teeth, it is no wonder that organs which are so important to health and appearance as the teeth should have their integrity seriously if not irremediably affected."

It seems unnecessary to cite any more cases, either for the purpose of showing the destructive tendency of the above-mentioned preparation of iron upon the enamel of the teeth, or that physicians are ignorant of such a condition of affairs.

It is now, I believe, generally admitted by almost every one who, I might add, has had an opportunity of observing the effects, that the tincture of the chloride of iron, although passing transiently through the mouth and over the surfaces of the teeth, nevertheless exerts a most powerful and pernicious action on their structure.

Two things are essentially necessary before arriving at a satisfactory conclusion regarding the cause of this destructive action:

1. A knowledge of the quantity of the different inorganic substances contained in the enamel of the teeth.†

* "The Deleterious Effects of the Muriate of Iron on the Teeth," DENTAL COSMOS, Vol. viii, page 345.

† Quantitative Analysis of the Enamel, by A. H. Elliott, Ph.D., College of Physicians and Surgeons, New York, April, 1886:

Phosphate of calcium,	87.97
Carbonate of calcium,	6.75
Phosphate of magnesium,	1.10
Organic matter,	1.75
Soda salts and fluoride of calcium,	2.43
	100.00

In the above analysis special attention was paid to obtain the exact quantity of the phosphate and carbonate of lime. In this respect the result of the analysis

2. The composition of the tincture of the chloride of iron,—*i. e.*, the nature and quantity of the acid it contains.

The tincture of the chloride of iron is made from the liquor ferri chloridum, and contains 37.8 per cent. of the dry chloride. In making the tincture of the chloride, thirty-five parts of the liquor are added to sixty-five parts of alcohol. Attfield says that the liquor which is used in making the tincture contains much free acid, which is necessary to prevent the precipitation of the basic salts of iron. It is obvious from this that the relative proportions of the iron and the acid, whatever they may be, are adjusted very delicately, and that whenever water or any other fluid is added either to the liquor or tincture the result is a constitutional disturbance,—*i. e.*, the affinity existing between the acid and the iron which is held in the solution is more or less disturbed according to the character of the fluid which is added.

Clinical observation shows that water increases the destructive energy of the tincture of the chloride of iron upon the structure of the teeth more than any other fluid, and, therefore, must necessarily not only cause more chemical disturbances when added to the solution, but do more injury to the teeth during the process of ingestion. As an illustration, the effect of adding water to a simple solution of the chloride of iron *devoid of free acid* is to give us basic salts of iron and the separation of free hydrochloric acid.

When a tooth is immersed in a solution of the tincture of the chloride of iron a double action takes place. First, the chlorine unites with the calcium, forming the calcium chloride; second, the carbonic acid is given off, and the hydrated peroxide* of iron is precipitated.

When a small quantity of the strong solution of the tincture of the chloride of iron (officinal strength) is placed in a test-tube and a little of the carbonate of lime is added, you will observe that there is a decided and immediate action, but no precipitation occurs. In a weak solution, however,—say one drachm of the tincture to the ounce of water,—the iron in the solution is at once precipitated. In the strong solution there is no precipitate until all the acid is neutralized by the carbonate of lime. On adding to the solution more lime, or immediately after neutralization takes place, there is the same precipitate, viz., the hydrated peroxide of iron; and this action continues until all the iron is precipitated, carbonic acid being given

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corresponds very nearly with the results obtained by Von Bibra and Hoppe Seyler. It is to be observed that in Elliott's analysis the enamel of twenty different teeth was employed.

*Synonyms: Hydrated sesquioxide of iron; ferric hydroxide.

off continually throughout the operation from the time the acid begins to neutralize until the last trace of the iron is precipitated. In other words, the perchloride of iron acts with the carbonate of lime precisely like an acid.

On referring to the card containing the specimens of teeth which have been immersed in solutions of the tincture of the chloride of iron of different strengths,* it will be observed that those teeth which have been immersed in the strong solution for a period of twelve hours remain unaltered in their structure and appearance, whilst those teeth immersed for the same length of time in a weak solution, consisting of only one-half a drachm of the tincture to an ounce of water, are very materially injured.

You will very naturally inquire why it is that a strong solution of the tincture of the chloride of iron, which, containing much more acid, and acting with far greater energy on the carbonate of lime than the weaker solution, as you have just seen demonstrated, yet has little if any effect upon the lime-salts of a tooth when immersed in such a solution. Before discussing this point let me call attention to an old and doubtless familiar experiment: When a piece of zinc is placed in strong sulphuric acid (H_2 SO_4), it will be observed that the acid has no effect whatever upon the structure of the zinc, but if a little water be added to the acid we find that the zinc is immediately destroyed. It is not entirely a matter of the strength of the fluids so far as the quantity of iron or acid is concerned, but a matter of construction or solubility.

The zinc in the strong sulphuric acid is protected from immediate destruction in the same manner that the tooth which is immersed in the pure tincture of the chloride of iron is protected,—viz., the surface is blocked up with basic iron salts, insoluble in alcohol, which prevents chemical action. In the case of the zinc it is the sulphate of zinc resulting from the first action, which is insoluble in the concentrated acid, that forms a protecting coat over the surface of the zinc. The addition of water dissolves this protecting sulphate and renders further chemical action possible. In the case of a tooth immersed in the strong solution of the tincture of the chloride of iron a similar action takes place,—viz., the oxide of iron first formed protects the tooth from immediate chemical action, owing to its compact adherence to its surface.

To illustrate still further, let me call attention to two other specimens of teeth on the card which were immersed in the tinture of

* Dr. Weld here refers to a glass case—presented by him to the Odontological Society—containing tabulated specimens of teeth which had been subjected for different periods of time to several solutions of the various preparations of iron.—[Editor N. Y. Odontological Society.

the chloride of iron and alcohol. Here we shall see that although the solution used contained the same quantity of the tincture and possessed apparently the same relative strength, being immersed for the same length of time, yet no injurious effect is produced on their lime-salts. The reason is due to the fact that alcohol is a dehydrating compound, and the peroxide which is formed in the alcoholic solution is of the anhydrous form, and in character very compact, adhering closely to the surface of the tooth, thereby preventing immediate chemical action; whilst, on the other hand, in the presence of water the peroxide, which is precipitated in the hydrated form, and is flocculent in character, does not so well adhere to the surface of the tooth, or at least the product of the decomposition is more easily removed from the surface, leaving the free hydrochloric acid in the solution to unite with the lime-salts with greater facility. Thus we find two forms of the peroxide of iron,—viz.: First, the hydrated form ($Fe_2(OH)_6$), formed in the water solution, which is flocculent and non-protecting to the teeth; second, the anhydrous form (Fe_2O_3), formed in the alcoholic solution, which is heavy and compact and protects the surfaces of the teeth. The following formula will show how the hydrated peroxide is formed from the anhydrous peroxide. ($Fe_2O_3+3H_2O=Fe_2(OH)_6$).

The teeth on the card that were immersed in a solution composed of the tincture and the elixirs are affected but very little. Take, for example, the teeth that were immersed in an ounce of the elixir of the pyro-phosphate of iron, with one drachm of the tincture of the chloride added, which was the quantity of the tincture used in the water solutions as shown in number three column. With water as a vehicle the enamel of the teeth is completely destroyed in twenty-four hours; but with an elixir in combination with the pyro-phosphate of iron and the tincture of the chloride, the effect on the enamel is hardly perceptible. The elixirs are composed of nearly twenty-five per cent. alcohol, the presence of which, as we have just seen in the strong solution of the tincture and in the alcoholic, affords a protection to the enamel of the teeth in the manner described. It is to be said, however, in this connection that when a tooth is immersed in a solution of the tincture and simple syrup, in the same proportions *as above mentioned*, the enamel is not much affected. This is probably due to a mechanical reason or a condition of fluidity of the solution. In other words, the presence of the sugar in solution coats the surface of the enamel, preventing chemical affinity between the acid held in the solution and the lime-salts. Equally interesting are the teeth immersed in a solution of the tincture and the weak alkaline waters (notably Vichy). When a drachm of the tincture of the chloride of iron is added to an ounce of

Vichy water, a slight effervescence takes place, indicating that the bicarbonate of soda in the water has neutralized a part of the free acid introduced with the iron. Thus, when a tooth is immersed in such a solution, the destructive energy of the iron is somewhat modified. Unless the specific nature of this preparation of iron to which I have alluded is materially affected (and by contact the peculiar odor of the tincture remains the same), I see no reason why it should not, at least in all cases of anemia, be administered in combination with Vichy. The specimens of teeth on the card show the slight effect such a solution produces on the enamel.

There is an objection to the use of alcohol, whether in the form of spirit or combined with syrup, in the form of an elixir. It has recently been stated by a prominent physician that, although the administration of a drug in the form of an elixir was pleasant and agreeable, and the patient perhaps cured of some particular disorder, yet it might be found after the cure had been effected that the patient had contracted a habit for strong drink. Nevertheless, alcohol in the form of a spirit is looked upon with favor by many of our best physicians, and frequently prescribed in the fevers and other affections associated with great debility. In such cases, when in addition to alcohol iron is also prescribed, they could doubtless with advantage to the patient be given together, and in this manner many teeth might be preserved which otherwise would be destroyed or seriously injured. Certainly *water* in small quantities, so far as iron in connection with the preservation of the teeth is concerned, is literally worse than nothing; and glass tubes seem to avail but little. When a tooth is placed in a weak solution of the tincture of the chloride of iron, the first appearance of a chemical action is indicated by the appearance of numberless minute bubbles distributed over the whole surface of the tooth. At the end of five minutes, if the fluid in the glass in which the tooth has been immersed be slightly agitated, a milky white cloud will be seen floating from the surface of the enamel, and if the fluid be agitated from time to time it will, in the course of twenty-four hours, become more or less turbid according to the amount of the tincture or alcohol contained in the fluid. If the tooth be allowed to stand in the solution without being disturbed, a precipitate of the phosphate of iron will in the course of thirty days completely invest the upper part of the tooth, hiding it from view. This deposit is beautifully shown in the lower right hand corner of the card. On the column just above can be seen the difference in the structure of the light and flocculent precipitate found in the weak solution, and the heavy and compact precipitate of the strong or alcoholic solution. At the end of thirty days from the deposit which is formed around the tooth there will appear

a number of projections, extending in an upward direction, which in appearance resemble stalagmites, and which are composed principally of the precipitate which surrounds or invests the tooth or the phosphate of iron. In connection with this phenomenon it may be said that it is a well known fact that in making the superphosphate of lime—*i. e.*, the soluble lime phosphate—for agricultural purposes the manufacturer chooses the phosphates that are free from iron, for the reason that the phosphate that they have made soluble will, from contact with the iron, become in time insoluble, forming the phosphate of iron, which shows that mere contact of the iron compound, although not soluble, will cause a reaction with the phosphates.

[Dr. Weld, after reading his paper, spoke as follows:]

I now wish to call attention to the action of one other acid upon the teeth, viz., acetic acid. A six per cent. solution of acetic acid affects the teeth precisely in the same manner, apparently, as a six per cent. solution of hydrochloric acid, differing only in degree; and yet when we come to experiment with these two acids we obtain, by reason of the difference of their degree of destructive energy, very different results.*

Whilst experimenting a short time ago, in the laboratory of Carl Heitzmann, and with the microscope noting the effect produced by different acids upon the enamel structure, I obtained certain results which will, perhaps, ultimately be the means of throwing some light on the matter of the distribution of the lime-salts and living-matter in the enamel. I had under the microscope a number of beautiful thin sections of enamel (mounted in glycerin) which had been immersed in acetic acid. The spaces that Dr. Heitzmann and Dr. Bödecker speak of as existing between the enamel-rods were so beautifully shown that Dr. Heitzmann was very much interested and pleased. But while I was looking at the section a second section came sailing along and passed directly under the first, so that instead of looking at one section I was looking at two. Of course, my focus was gone, and I felt annoyed at losing my beautiful section of enamel-rods. To get rid of the second section I tilted the microscope slightly and struck it quickly on the table. What was the result? Why, when I looked again for my section I found it broken in pieces. The slight jar had isolated every enamel-rod, and I was looking at what appeared to be a bunch of sticks. Upon reflection the thought came into my mind that, whatever the cement-substance may have been which united the broken and separated rods, that substance had been destroyed by a weak solution of acetic acid, and that the enamel-rods had not been affected.

* Whether we use a weak solution of hydrochloric, phosphoric, or acetic acid, the enamel is first attacked and destroyed.

I do not, at the present time, desire to say positively that the enamel-rods are composed of phosphate of lime, and that the intermediate cement-substance is composed of the carbonate of lime, but the inference from this and other experiments leads to that conclusion; otherwise how is it possible with a six per cent. solution of acetic acid, which does not destroy organic matter or animal tissue, to separate the enamel-rods? To strengthen this hypothesis, I wish to direct your attention to the effect produced on the carbonate and phosphate of lime by a six per cent. solution of acetic and hydrochloric acids (the latter being the acid found in the tincture of the chloride of iron).

In this test-tube I have a six per cent. solution of acetic acid. On adding a little pure carbonate of lime or chalk, and shaking the contents, you will observe a very decided chemical action, carbonic acid being continually thrown off; and this six per cent. solution of acetic acid has, as you now observe, eaten up every particle of the carbonate of lime.* In another test-tube, containing about the same quantity of acetic acid, of the same strength, I will add a little of the phosphate of lime (bone phosphate). What is the result? The acid apparently has no chemical effect upon it. The phosphate of lime is simply held in suspension. Fresenius states that acetic acid destroys the phosphate of lime. This is true so far as strong acetic acid is concerned,—*i. e.*, acetic acid of the officinal strength (36 per cent.). The point to be noted in this connection is that a six per cent. solution of acetic does not act on or destroy the phosphate of lime, but does completely destroy the carbonate of lime. If I employ a six per cent. solution of hydrochloric acid, as you now observe, the phosphate of lime is quickly destroyed.

Thus the experiments show that a six per cent. solution of acetic acid attacks and destroys the carbonate of lime, but not the phosphate, whilst a six per cent. solution of hydrochloric acid destroys both. In connection with these experiments and the subject of the paper,—viz., "The Destructive Energy of the Tincture of the Chloride of Iron on the Teeth,"—it is obvious that whether we use acetic, hydrochloric, or phosphoric acid, the carbonate of lime in the enamel is the most susceptible and the first attacked and destroyed. The teeth in the case which were immersed for twenty-four hours in a solution of the tincture of the chloride of iron and milk show very plainly that the cementum and dentine are not affected, but that the enamel is. The acid in this case curdles the milk, and this curd catches the iron precipitates, so that we are enabled to see the full effect of the weak acid on the enamel, minus the presence of the iron precipitates.

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* If any sediment is observed after the action of the acetic acid it is due to the impurity of the carbonate of lime.

As I stated in the paper, there are three menstrua which may be used to modify the destructive energy of the tincture of the chloride of iron. The first is alcohol in some form. The second is Vichy water, which neutralizes to a slight extent the free acid in the iron. The third is some form of a syrup.

The specimens of teeth in the case which were immersed in three different weak solutions of phosphoric acid show the difference in the effect produced on the enamel by the water and the syrup solutions. Two of these proprietary medicines were water solutions, and the effect was to injure the enamel of a tooth in one hour, whilst the last one, a syrup solution (each fluidrachm containing two grains of free phosphoric acid), produced but little if any injurious effect on the enamel in twenty-four hours.

As another illustration, take an ounce of the elixir of the pyrophosphate of iron, and add one drachm of the tincture of the chloride. Here we have the full strength of the pyro-phosphate plus the strength of the tincture of the chloride; but the teeth in the case show that this solution has no effect whatever on the enamel for a period of twenty-four hours; yet the use of the same quantity of water instead of the elixir destroys the enamel in one hour.

Discussion.

The President. Gentlemen, I take the liberty of extending to Dr. Weld your thanks. The subject he has presented is one of exceeding interest, and I hope it will meet with such a reception as to encourage further study and investigation of the subject.

Dr. Bödecker. I must thank Dr. Weld for the very interesting paper he has read to-night. I think it will do a great deal of good to both the medical and dental professions as well as to our patients.

In connection with this subject I will refer to a patient who came under my observation during the past year with teeth greatly injured by the extensive use of chloride of iron. The lady was sent to me by a physician who requested me to extract several of the roots that she had in her mouth, and all the teeth which were in a bad condition—claiming that her disease (progressive pernicious anemia,) had had something to do with the decay of the teeth and roots, as has also been claimed by some European authority. She had been under the care of another physician for several years, and had taken great quantities of iron, without deriving any benefit therefrom. The physician told me that he was about to prescribe arsenite of potassium (Fowler's solution). When the patient came into my hands I tested her saliva, which I found to be only slightly acid. The teeth were in a terrible condition. Wherever the saliva had free access to the teeth they were fairly well preserved; but the labial surfaces of both the upper

and lower front teeth were almost entirely bare of enamel, and in some places the dentine presented a pitted appearance. I removed two or three of the roots and filled the teeth, though the enamel was softer than any I had ever seen. I took a great interest in the case, and, desiring to watch it carefully, I asked the lady to let me see her again as often as convenient, which she did. While she was under the arsenious acid treatment I again examined her saliva, and found it contained a great deal more acid than it did when she had been taking the chloride of iron; but the teeth were in a better condition. I saw the lady again about a month ago, and the softening of the tooth-structure had been nearly stopped. I came to the conclusion that in this case surely an acid condition of the mouth did not have so much to do with the softening of the tooth-structure as the administration of the chloride of iron.

I have experimented with enamel very largely, one reason being that when I began to investigate this tissue Dr. Heitzmann insisted upon having it softened and cut with a razor. He was opposed to the process of grinding specimens, and remarked, "You cannot preserve the living tissue in ground specimens. It will all be torn out and dirt left in its place." I first softened the teeth in a solution of chromic acid, to which, every other day, two or three drops of dilute hydrochloric acid had been added. In the course of time the enamel was softened, but not to such an extent that it could be cut. Dozens of razors were spoiled in these attempts without obtaining a single preparation that was worth anything. Then we tried other ways. I used lactic acid, picric acid, nitric acid, and hydrochloric acid. With this latter we were able to soften a tooth very quickly; and I tried to cut a few chips off from the enamel; then mounted and examined them; but I believe I have been able to obtain but one specimen of enamel in this manner. Very often we observed such bundles of enamel-rods as Dr. Weld describes; but at that time I was investigating the question of living-matter, and did not go into the chemistry of the subject, because eventually, as you know, I had to come to the grinding process for obtaining good specimens of enamel.

The reagents, such as hyperosmic acid, employed to stain the substance in the enamel which I have described as living-matter do not stain carbonate of lime or any tissue except nerve-tissue or living-matter proper. How, then, can this substance be carbonate of lime, as claimed by Dr. Weld? In fact, all the microscopists—and I remember one excellent chemist who has experimented with acids upon a section of enamel in the same way that Dr. Weld has—seem to agree with me as to the histology of the enamel, as well as that of the dentine. I am positive that there is living-matter in the enamel.

Dr. S. G. Perry. I think Dr. Allan called the attention of the society at the last meeting to the idea that the enamel-rods were held together by what he called carbonate of lime cement.

Dr. Weld. I had some conversation with Dr. Allan some weeks ago, informing him of this fact; doubtless he casually alluded to it.

Dr. Perry. I am quite sure he laid stress upon that the other evening. That idea is not, I think, in accordance with Prof. Heitzmann's teachings.

Dr. Weld. Prof. Heitzmann does not deny it, I believe, though I do not know that he believes in it at all. If the cement-substance which holds the enamel-rods together be composed of carbonate of lime, of course it cannot be living-matter, because there is no nourishment in the carbonate of lime. The only question is whether the living-matter which might be between the enamel-rods at first could afterwards be obliterated, or whether both the carbonate of lime and living-matter can exist together.

Dr. Perry. If it is the carbonate of lime that holds the enamel-rods together, it upsets the old theories entirely.

Dr. Weld. Suppose this to be a section of enamel-rods which has been subjected to the action of acetic acid [drawing on blackboard], and suppose these to be the intermediate spaces. If I use a weak solution of acetic acid, I find at first these spaces are very small. If I use a stronger solution, I find that the spaces are wider; and the stronger the solution is, or the longer the enamel is kept in a weak solution, the wider these spaces grow, and the more frequent the transverse spaces occur that have been spoken of by Dr. Bödecker and Dr. Heitzmann. But when I take a section which has been prepared in a weak solution of acetic acid and subjected to the action of a coloring matter, I must confess that I have thought at times the coloring matter appropriated itself to the edge of these enamel-rods. Whether this is due to any existing reticulum or not I cannot now say; but I know that with a preparation of enamel placed on a slide with a covering-glass over it, if I put two or three drops of a six per cent. solution of hydrochloric acid on one side of the covering-glass and apply a piece of blotting-paper to the opposite side and draw the acid through, I can under the microscope see every one of the rods disappear. But something resembling living-matter is left behind. Doubtless there is organic matter in the enamel; but whatever the quantity may be, it is arranged very differently, I think, from what Dr. Bödecker thinks it is.

Dr. J. W. Clowes. There has been so much of good said to night, and said so well, that I doubt if any words of mine will enhance its value. I am well pleased to have so goodly a helper come to my aid. He has disclosed the forces of evil in a masterly manner, and taught

me how to disarm them. Supposing that water, by diluting, would render tincture of iron less harmful, I have always advised its abundant use; but it appears now, through lack of chemical knowledge, that I was contributing to destruction! I claim credit, nevertheless (and you will bear witness to my desert), for having declared not only the existence and presence of an enemy, but for designating it rightly as "the most ruthless tiger of the laboratory lair." Summer is well on its way, and for a while our associate labors must cease, but I do hope the shots already fired will not be forgotten, but continue to remind us of duties yet to perform when we meet again. I am anxious to learn of Dr. Weld how the enemy is enabled to construct those *intensely white pits* so frequently seen on cervico-labial portions of the teeth, and regarding the concentration of force at special points.

Dr. Weld. When a tooth is immersed in a weak solution of any kind of acid, the acid takes effect at one point sooner than at another, owing perhaps to the fact that the enamel is thinner or more imperfect there, or that the carbonate of lime between the enamel-rods is more exposed than at other points.

Dr. Clowes. I am greatly obliged to Dr. Weld for presenting these results of his investigations, and I think he is a benefactor to his race; but there is yet a great deal to be known about this matter, and I hope he will continue his researches.

Dr. W. H. Dwinelle. There is probably no subject connected with our profession of greater interest than this general subject of acids and their action upon the teeth. I am very glad that it has been brought up to-night, and in a more scientific and satisfactory manner than ever before. An evening would be too short a time in which to discuss the paper properly, but when it is published we can study it at our leisure, and be rewarded by so doing. It is a matter of great satisfaction to me that we have, through the efforts of our worthy friend, been brought into a position where we can come to some conclusions in reference to the decomposition and erosion of teeth by acids. I think that Dr. Weld has thrown a great deal of light upon the subject. He has certainly brought forward some very interesting facts that were not known to us before, and he has enabled us to qualify and modify the ravages of the enemy; an enemy which, nevertheless, we must hold as a friend when intelligently used. We must use it, notwithstanding our worthy friend, Dr. Clowes, repudiates it utterly, and believes that the hydrochloric is the only acid that affects the teeth. It has been demonstrated to be one of our most valuable medicines. It is a matter of great satisfaction that Dr. Weld has discovered that we may use it as a menstruum in conjunction with Vichy water, alcohol, or syrups

with impunity. That the addition of water—a fluid which we have hitherto regarded as the most harmless of all fluids—to the tincture of iron should be found to give a peculiar potential force to the action of the hydrochloric acid, is certainly a remarkable discovery and a very interesting paradox. Dr. Weld establishes the fact to our satisfaction, that acetic acid acts freely upon the carbonate of lime, but does not act upon the phosphate of lime, of which the enamel-prisms are mainly composed,—the interspaces being composed of the carbonate. He has shown us that a six per cent. solution of acetic acid, by means of this free action upon the carbonate of lime, will separate the enamel-rods. I cannot sit down without thanking Dr. Weld most heartily for presenting to us these valuable results of his investigations, and I think I speak the sentiments of the society when I say that he has placed us under great obligation to him. He has introduced a subject that will invoke further thought and reflection, and in the end I believe that great good will be derived from it.

The case brought up by Dr. Bödecker reminds me of several that I have had in my hands during a series of years, one of which I call my lemon or citric-acid case. If you will bear with me a little I will refer to it. A lady whom I had dismissed in November with her teeth in perfect condition came to me in the following February with her front teeth much eroded, in a peculiar way. The enamel had the appearance of having been deeply carved or engraved with characters resembling those which are seen upon the obelisk in the Park. I have casts showing the appearance of the teeth at that time. After a while I discovered that some one had told the lady that if she ate freely of lemons she would live forever, or something to that effect. Having that desire, she went to eating them vigorously, sucking the acid into her mouth, upon and between the superior front teeth; which habit soon brought about the condition of things which I have described. I was puzzled to know what to do, for some of the excavations appeared to go almost through the enamel. I put the patient upon lime treatment, internally, and directed her to invest her teeth in an alkaline paste every night. In a short time I had the pleasure of noticing that the process of destruction had been arrested. I treated her from February to May, and then polished down the eroded surfaces. Of course, the remaining enamel is exceedingly thin, but the teeth have preserved their form and contour. The lady is now in St. Petersburg, and I have a letter from her stating that there has been no change for the worse in these teeth. As thin as the enamel is, I am satisfied that with the care she takes, and with the constitutional treatment which she is wise enough to resort to, she will preserve them intact as long as she

lives. I might add that I have plaster casts of her teeth, taken three years after treatment, showing that their restoration to health was permanent.

It is to be observed that in many cases the condition of the saliva, being in a normal state alkaline, will qualify the action of the acid, and that the destructive energy of the tincture of the muriate of iron may depend upon the fact that the saliva is acid in reaction. Dr. Rollins, in his paper to-night, touches upon this point, and the importance of frequently ascertaining whether the saliva is acid or alkaline.

Adjourned.

S. E. Davenport, D.D.S., M.D.S.,
Editor N. Y. Odontological Society.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

The First District Dental Society of the State of New York held a regular monthly meeting, Tuesday evening, June 1, 1886, in the rooms of The S. S. White Dental Manufacturing Co., corner of Broadway and Thirty-second street.

The president, Dr. William Carr, in the chair.

Dr. W. H. Atkinson, of the Clinic Committee, reported as follows:

Mr. President, the chairman of the Clinical Board has invited me to read what he has written as the report: The attendance was about forty-five. . . . Dr. D. A. Williams sent a patient, thirty-four years of age, with a double fracture of the lower jaw. The plate had been in position one week. . . . Dr. E. P. Brown presented a patient, his daughter, with some beautiful contour fillings in the first lower molar and second bicuspids; the former involving the mesial and grinding and the latter the distal and grinding surfaces. He then filled with the electric mallet for a patient present the posterior surface of a left inferior first bicuspid, and the anterior and posterior surfaces of a left inferior second bicuspid. . . . Dr. Main exhibited a lower set made of gold by a patient who had never studied dentistry. The set in the mouth weighed 73 dwts. with the springs. The pressure was said to be 360 dwts. The springs were held to the set by flat pins in such a manner that they can be easily adjusted and removed by one who understands the kink. . . . Dr. C. A. Timme showed a new abscess and hypodermic syringe, with a metal casing. . . . Dr. Reese, of Brooklyn, presented a tumor which had been removed by ligatures from the right side. . . . Dr. T. J. Thomas presented two partial sets, of bone, one of which had been worn by the Duke of Brunswick. . . . To make the case presented by Dr. George F. Reese more clear to your minds, I will read the record of it, as given by him, which is as follows: "In July last a gentleman

came to my office suffering from a tumor which was located at the extreme end of the right side of the lower jaw, and requested me to remove a wisdom-tooth that was in a highly irritated condition, owing to the growth of the tumor, which I did. The tumor was at that time about the size of a bean. I explained to him the serious nature of the growth, and urged him to have it attended to immediately; but, being obliged to leave the city at the time, he decided to wait until fall. Nine months afterwards he came to me and stated that he had been treated by his family physician for the past four months without beneficial results. The tumor had grown in the meantime to the size of a small walnut, was firmly fastened to the jaw-bone, and quite hard in substance. On his telling me that his physician advised him to consult Prof. Helmuth, I urged him to do so. The professor advised him to have it cut out at once, and, in order to successfully perform the operation, to take board in the hospital. The gentleman, now realizing the danger of the delay, and fearing the use of the knife, came to me again and requested me to take entire charge of the case, which I did, feeling assured that my method would prove a success. My treatment was as follows: I commenced by placing a slightly drawn rubber band around the tumor close to the gum, which I allowed to remain two days. I then removed the band, syringed the parts thoroughly with lukewarm water, and washed the tumor with a solution of bichloride of mercury, after which I treated the part which had been covered by the band with tannin and glycerin. The same treatment was repeated every other day, gradually tightening the band. In six days the rubber had imbedded itself about one-eighth of an inch all around the base of the tumor. Up to this time the patient had experienced no pain. I continued the same treatment up to the eighth day, when the patient began to experience slight pain, so that I found it necessary to remove the tightened band for a looser one during the night, tightening it again in the morning, and using tincture of aconite to deaden the pain. About the twelfth day the pain ceased. and I could see a slight shrinkage of the tumor. I also noticed that it had changed color, it being much paler than before. I now touched the top of the tumor with salicylic acid, and tightened the band very much, using the same treatment as before up to the eighteenth day, when I found that the tumor yielded to a slight pressure of the finger. Upon pressing a little harder the cords broke, and, to my great satisfaction, the tumor came off. A slight hemorrhage followed, but stopped naturally in about fifteen minutes. I have seen my patient daily since. He has suffered no inconvenience and the wound is almost healed." . . . Dr. Atkinson: I wish to say just here that this is one of the cases that I glory in, for it shows us

the difference between real and assumed intelligence. Here is a patient who has been in the hands of men who are renowned for their diagnostic ability, and who pronounced a benign tumor malignant and very dangerous, while the man who really has the knowledge requisite to diagnose the case and treat it, without specially sounding his fame to the world, sees the truth, intelligently obeys it, and blesses his patient by following the real indications of the case.

The secretary read the following communication from Dr. E. L. Fuller, of Amherst, Nova Scotia:

Gentlemen: The paper by Prof E. T. Darby on "Erosion of Enamel and Etiology of Labial and Buccal Caries," in the April number of the Dental Cosmos for 1884, as well as the able discussion of the same in the March number for 1886, I have read with great interest. I find on my record book a case which may be of interest to the society.

A young married lady, aged thirty years, came to my office in November, 1882, with her four superior incisors eroded,—two of them nearly and the others quite through the enamel, and so sensitive that she could not bear the slightest touch of an instrument. She was exceedingly anxious to know the cause, her other teeth being perfectly sound and showing no sign of decay at any point. She said they commenced about one year and a half previous to her visit to my office, and also stated that her sister (who was some years older) was in the same condition. I informed her that I thought likely it had been caused by some medicine she had taken, as I found that the fluids of the mouth were in a perfectly normal condition, with neither an excess of acid or alkali; but to my surprise she informed me that she had never taken an ounce of medicine in her life that she could remember, and she certainly did not look as if she needed anything of the kind. I also inquired if she was in the habit of eating acid fruits to excess, and she informed me that she was not. I filled the cavities with cotton saturated with tannic acid, glycerin, and chloroform, and dismissed her until the following morning, when I carefully excavated and filled them with gold. I saw the lady some few weeks ago, and the fillings were perfect, and she has had no further trouble.

Some two months after the above patient's first visit she came to my office bringing with her a boy, six years of age, for me to extract his two central and right lateral superior incisors, which she said were bothering him. He had erupted three of his sixth-year molars, and the remainder of his teeth were sound and remarkably clean for a child's temporary teeth, his mother having taken great pains with them. I noticed that the teeth she desired me to extract were in exactly the same condition as her own, and were devoid of the green stain so often found upon children's teeth. I extracted the teeth and asked her to bring the little fellow as soon as his permanent teeth had made their appearance. In the meantime I advised her to give him phosphate of lime, thinking that it might aid the structure of the permanent teeth, although late in the day. She very kindly kept her promise and brought the little fellow, and I was pleased to see that the permanent teeth were smooth, white, and regular, and dismissed the patient well pleased with the way they had come through. But to my surprise and annoyance she returned to my office in eight months with the little fellow, showing me his superior centrals and one lateral in exactly the same condition of erosion as her own, and up to the time of writing this I have filled the three with

gold, and the other lateral is going as rapidly as it can. I tested the fluids of the mouth and found them normal. The patient is perfectly healthy, and never had a day's sickness to amount to anything.

After reading the discussion that took place at a recent meeting of your society, and looking up this case in all its phases, I am led to think that it is not only a constitutional trouble, but possibly hereditary. I send this, stating my views on the matter, that I may get the opinion of those who have had years of experience in such cases, and if what I have written should by any means throw the least ray of light upon the subject, I shall feel highly compensated for my trouble in keeping the record of the case. I remain, yours truly,

E. L. Fuller, D.D.S.,
Amherst, Cumberland County, Nova Scotia.

Dr. Atkinson. This is another instance of inability to diagnose conditions. Here is another example of what I have heard with regard to the mouth being acid or alkaline, the case having probably been examined once or twice a day. The statement has been left with too many open spaces in it. What is the fact with regard to the digestory operation? What is the fact with regard to the moleculogical status of that which now holds such a grip upon physiology? They say that microbes which live five minutes and have an infinite progeny are the acid producers. Who has made observations adequate to even point towards a solution of that question? When we simply say the mouth is acid or alkaline we are left without any record at all as to how many observations were made, at what times they were made, or whether they were influenced by the taking of food. The want of such data leaves us without the ability to determine anything as to the antecedents and sequences of these cases. I am thankful to Dr. Fuller for having written this communication and stated what he has stated, however incomplete it is. The trouble is that men will jump at conclusions without adequately surveying the testimony that bears upon the case so as to bring their minds into a condition to decide for or against any proposition. Since the experiments of Dr. Miller the dental world has gone crazy on the subject of making pure cultures of the bacteria, without in the first place having had any classification that one can hold to. I am glad these things are talked of, because it stimulates us to turn our attention toward them, and to probe a little deeper, until we shall have arrived at the conditions that are antecedent and sequent to what we call caries. I wish Dr. Fuller had told us what he means by heredity, what he means by constitutional degeneracy, and what he means by acidity and alkalinity.

Dr. Eben M. Flagg read the following paper upon

Dentistry in the Region of the Rio de la Plata, South America.

The title of this paper has been announced as "Dentistry in South America." A more comprehensive title would be "Dentistry in the

Region of the Rio de la Plata." This river and its tributaries drain a territory extending from the Andes Mountains eastward to the Atlantic Ocean, and northward into the interior some two thousand five hundred miles. The river itself is navigable for more than two thousand miles, and thus affords easy access to the adjacent countries of Western Brazil, Eastern Bolivia, Paraguay, the Argentine Republic, and Uruguay. This area is more thickly populated than any corresponding amount of territory in South America. It is almost entirely without the limit of the torrid zone, and therefore offers great inducement to the immigrant by securing him a climate that more nearly resembles Western Europe and the United States. The basis of population is Spanish, largely mixed with native South American. Spanish is the language. Those of Spanish descent are or have been the largest land-owners and consequently can dictate the laws, the habits of thought, and to a great extent the manner in which laborers shall employ themselves. All official documents are in Spanish; all public instruction, all business of courts, etc., is carried on in Spanish. The immigration is made up of Italian, English, German, and French, but in spite of the strongest egotism of the immigrant he eventually yields to Spanish influence, if not directly, at least indirectly, through his children.

From the foregoing it will be recognized that the population is and must be Spanish in its positive characteristics, modified merely by whatever *that* character can assimilate.

Being now in a position to discuss those matters that more nearly relate to the North American dentist, we will suppose he arrives at Buenos Ayres, the capital of the Argentine Republic, which has nearly four hundred thousand inhabitants. The first object he meets on landing is well designed to discourage the new-comer, and is known by the name of custom-house. The Argentines have a superstition, imported from the United States, that the more goods they can keep out of a country the richer the country will become,—particularly so, if the *home* product is inferior and the foreign prohibited product superior. According to *law* the dentist has a right to pass the custom-house with all his instruments, apparatus, etc., provided he accompanies them; but if he is unacquainted, or has no vouchers, he may be subjected to much annoyance. I remember two dentists whose goods were detained in the Buenos Ayres custom-house nearly a week, though they demanded an examination and swore they had nothing dutiable. At last the official agreed to give up their trunks if they would pay him one hundred dollars. This they refused, and persisting in their claims they tired out the official, who at last suffered their goods to be removed without further attempt at extortion. The custom-house officials at Buenos Ayres are neither better nor worse than any others,

and it is saying much for the inherent goodness of humanity that these legalized highwaymen are not so unmerciful as the law allows them to be. When an attempt at extortion is made it is much better to tire out the official than to bribe, and the average Yankee who cannot weary a foreigner by sheer persistence is hardly worthy of the name.

The mere possession of a diploma will not permit a dentist to practice without incurring great penalties and running great risks. He must be authorized by the medical faculty of the Republic, and to obtain that authority must submit to an examination. In case he has no diploma, but is practicing upon the strength of an apprenticeship and what he can pick up, he will be compelled to undergo the prescribed course of study—three years—when he will be turned out an enthusiastic tooth-puller. We take somewhat less than two years to manufacture a doctor of dental surgery. This is one of the proverbial comparisons that are odious.

But supposing our dentist to possess a diploma, he must undergo the ceremony of an examination to have that diploma "revalidated." There is no English synonymous word, but it is either revalidate or boycott, and these are the various steps required to "revalidate" him: He hunts up the United States consul, to whom he presents his diploma, and proceeds to satisfy the consul that he is the party mentioned in the diploma, and that the college issuing the diploma does not belong to the Delavan nor Buchanan families. The consul, being satisfied, issues a certificate of genuineness for the man and his diploma, and the dentist, after paying him five dollars and upward, affixes a revenue-stamp to his certificate; allows his consul to write the result of his investigations on the back of the diploma, and proceeds forthwith to the Secretary of State, to present him his consul's certificate and show him his diploma. It is the duty of the Secretary of State to inform the medical faculty, by means of *his* signature, that the consul's signature is not bogus. This operation takes from three days upward, and costs a fee.

The dentist is now in a position to address the medical faculty, through *their* secretary. It costs him some more money in stamps, and he presents his diploma and consul's certificate, accompanied by his petition for examination. The secretary of the faculty now exacts two witnesses to the dentist's identity, and he resigns himself to await the summons of the examining board. I am acquainted with a graduate of the New York College of Dentistry (Dr. Dunster), who informs me that he has already been waiting three years for his examination without success. When finally summoned, the first step is called the *practical* examination. The candidate presents himself at the laboratory of a native dentist; is handed a plaster model (from

wax impression) and required to make a rubber plate that will fit the model. He is thus compelled to vulcanize upon plaster that is poured into his model-plate, and having done this, has fulfilled all requirements supposed to pertain to prosthetic dentistry. He receives written acknowledgment that the *practical* examination is satisfactorily passed, and he presents himself for the theoretical, accompanied by one hundred and fifty dollars. The one hundred and fifty dollars undergoes a short practical examination and is accepted. His artificial piece is deposited in the medical museum, and he confronts the examining board, consisting of four professors, as follows: First, anatomy; second, surgery; third, operative dentistry; fourth, materia medica. That you may have a better idea of the examination I will give you a few of the questions and some answers in the order just written:

1*st. Anatomy.*

Question. (Candidate is handed an inferior maxilla.) Describe the changes in that bone from infancy to old age.

Q. To what cause or causes are these changes due?

Q. What kind of tooth is the strongest,—I mean best constituted to resist the action of caries?

Q. Why is a *yellowish* tooth stronger than a *whitish* one, for instance? (Here follows a discussion upon temperament, in which the examining board became more or less involved.)

Q. What is the process by which the roots of deciduous teeth become shortened as the permanent ones advance behind them?

Q. Is there not a special secretion at work to shorten the temporary root rather than the mere absorption from pressure? etc.

2*d. Surgery.*

Q. Have you observed the accretion called salivary calculus, vulgarly known as "tartar"?

Q. Do you ever advise its removal?

Q. If the sustaining tartar be removed from teeth, how will you prevent their loosening and dropping out, or how will you defend them from the attacks of caries?

Q. If a patient came to you with a swollen face, the result of a carious tooth, would you extract that tooth there and then, or wait until the inflammation had subsided?

Q. You say you would treat the tooth and save it. That would be your duty to your art. But suppose it was gone beyond hope, would you not send that patient away and tell him to return when the swelling had subsided, and *then* extract the tooth?

Q. In case of excessive hemorrhage after extracting, what course would you pursue?

Q. Why would you *not* use persulphate of iron for arresting hemorrhage?

Q. If a patient came to you with his mouth very much inflamed, so that certain glands in the neck were affected (I do not mean the tonsils), what course of treatment would you prescribe and what would be the name of those glands? etc.

3d. Operative Dentistry.

Q. How many roots has an upper molar?

Q. How many roots has a lower molar?

Q. How many cusps has an upper molar?

Q. How many cusps has a lower molar?

Q. If an upper molar has five cusps, how many are outside and how many inside? etc.

4th. Materia Medica.

Q. Are you acquainted with the anesthetic called protoxide of nitrogen, but vulgarly known by the name of "laughing gas"?

Answer. I have made and administered it for the last fifteen years.

Q. What sort of an anesthetic is it?

A. It is the safest anesthetic known to science.

Q. I don't mean that. Is it local or general?

A. General.

Q. Are there any objections to its administration?

A. Like all anesthetics, it must be given carefully.

Q. Would you give it to a patient who had heart disease?

A. When a patient has heart disease it is well to keep him free from pain and unnecessary shock. If I could avoid these by giving nitrous oxide, I should consider it my duty to do so.

Q. Who would be most likely to know if a patient *had* heart disease?

A. The family physician of the patient.

Injunction.—Well, then, I want you to understand that under no consideration whatever are you ever to give any anesthetic without the presence and permission of a recognized physician of this faculty, and if you disobey this injunction it will be entirely at your own risk.

This closed the arduous labors of the examining board. They retired to an ante-chamber to discuss the case and drink some tea. I was then informed that I had passed the examination by seven to three; was required to take oath that I would practice dentistry to the best of my ability, and permitted to depart in peace.

In Victor Hugo's great work, "Les Misérables," speaking of the street urchins of Paris, he makes use of the following words: "The gamin has wretched teeth, but that is because he is badly nourished and his stomach suffers." Gentlemen, we may survey the entire field of dental literature and not find any cause for dental evils more concisely expressed or more truthful than is given in the above sentence from the French philosopher.

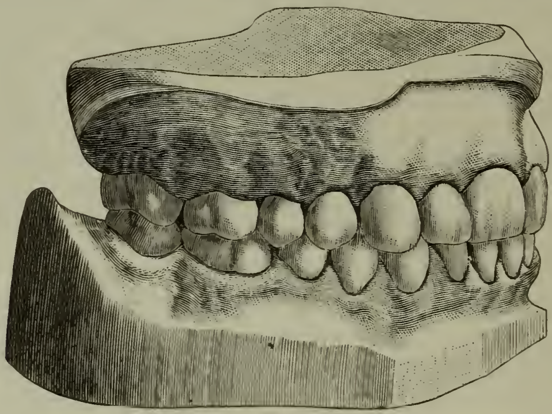
To such as believe that the ends of dentistry are accomplished when existing decay has been removed and the cavity filled; that the responsibility of the dentist has ended with pocketing his patient's fee; that any inquiry into antecedents is out of the province of the dentist; that any questions as to diet or instructions concerning the future conduct of the patient are mere impertinence on the part of the dentist,—to such, I say, these words of Victor Hugo may carry little meaning. But to him who sees within his

science the means of restraining one of humanity's greatest curses the case is far different. Such a man knows that scientific dental practice must begin with life itself, and, whether it be in the crowded city of New York or the vast regions of South America, such a man is always welcome.

So far as I have noticed, South America is no more exempt from dental disease than any part of North America. The same causes operate to destroy the human denture, and the same treatment is required to arrest destruction, there as well as here. I have seen every stage of civilization, from the doctors of philosophy in Buenos Ayres and Montevideo to the wild Indians of Matto-Grosso, and in every case where he has wretched teeth it is because "he is badly nourished and his stomach suffers." To the Indian who is master of his own conduct; who can raise his own mandioca, and can fish where he pleases; who can go into the woods when the meat hunger seizes him and shoot enough game to satisfy his family's wants, there is no danger to be apprehended of his teeth decaying. He will die of old age and retain every tooth. Take, now, the same Indian and subject him to what we call civilization. He may be badly nourished because he is over-worked and under-fed, and his system too much weakened to assimilate those elements necessary to dental health, or he may be badly nourished because he is over-fed and under-worked, and his system is thereby too sluggish from engorgement to properly perform its functions. In one case his stomach will suffer for lack of proper employment; in the other it will suffer from overwork; but in either case dental disease will be a prominent result. Our society has so ably discussed this subject that it may seem unnecessary to recall it now; but the above sentence of Victor Hugo shows so clearly how the truly inspired philosopher, whose object is the benefit of humanity, may in one moment seize upon a principle whose study and development is worthy the labor of a life, and this sentence comes so home to our labors, that I could not resist the opportunity of quoting it. The use of nature's opportunities are now denied to him. He can neither hunt, fish, nor plant without permission from the land-owner or speculator, who may take from him the results of his toil. Nature, that unerring guide to the necessities of mind and body, is now so disturbed by interference that the patient becomes speedily a prey to the unnatural. He drifts toward centers of population; he "drinks to forget his misery," as the Bible recommends. His own dissolution commences, and that of his family follows. You can see such Indians by the score in every town from Buenos Ayres to Cuyaba, and their teeth are no better than those of the savages to be found in the slums of large cities.

It has been said that the South Americans generally have better teeth than we, but this assertion is only true of the few who are able to visit a dentist or whom one meets abroad.

The model here shown is taken from the mouth of a young Paraguayan gentleman who has all the race characteristics of the South American Indian. A careful inquiry into his antecedents leaves no doubt but that he has lived, as Marcus Aurelius puts it, "according to nature." In beauty of design and exquisite finish of detail it would be impossible to find a superior dental model among the highest aristocracy of Europe. I have deemed this model worthy of reproduction in porcelain for the benefit of the dental profession of the world. As you may see by these carvings, it has nothing of the grossness or shapelessness that characterize the lower forms of human teeth, and, though the model is full grown, you perceive that he lacks the wisdom-teeth, those organs that have been made so



famous by Darwinian discussion, and whose absence Professor Darwin considered a sign of human advancement.

Wealthy South Americans are better connoisseurs of living than we. They do not take their beefsteak fried. They eat their meat before it has been deprived of all its juices. There is no object to adulterate their coffee. Their wine is purer. There is no saleratus in their bread. Above all things, they are not continually under the lash, as we of the United States are. No slaves under the hardest taskmasters work so ceaselessly, so frantically as do we in the United States. Anyone who is acquainted with the drain upon the phosphates occasioned by severe mental strain can readily understand how the American tooth must suffer. Even if it is too dense to be attacked by caries, the prostration caused by overwork will so depress the vitality of the tooth's environment that it drops out undecayed. Prosperous South Americans, who are beginning to copy

our mode of life, are beginning to have the same dental troubles; but, unfortunately for them, the great bulk of dental practitioners who serve them will consider an aching tooth an all-sufficient cause for extraction. This is the case even with many men holding diplomas from our Northern colleges. They will tell you of how they tried hard to cure an aching tooth, and eventually lost it; how much their reputation was damaged by their failure; and so the next aching tooth that came their way was sacrificed to the demon of fear. You are sometimes asked to listen to the recital of a certain operation. The operator will explain how he struggled and strove, how he strained and almost gave up, but at last succeeded,—to what? To deprive his patient of a tooth! The membrane was so good, the alveolus so dense, that it took all his muscle to *deprive* a fellow-being of a valuable organ which his brains should have prompted him to retain.

There are United States dentists in South America who, in self-sacrifice and scientific attainments, are not behind any to be found in this country; yet it is no more than just to say that the great majority consider an aching tooth sufficient cause for extraction. We have our dental societies here, and in a hundred ways educate our people up to their rights in the event of dental employment. In South America, on the contrary, professional association is so difficult, and so much suspicion exists among practitioners, that the people are served rather as the dentist pleases than as their necessities demand.

The medical examining boards are composed of men who are considered deeply learned,—some of them even having European reputations. Their course of study is at least ten years to qualify them for the practice of their profession. All of them are masters, or at least bachelors, of art. Yet hardly one of them is able to pronounce upon the loss or salvation of a "dubious" tooth; and, not being able to do this, who can say that they are qualified to pronounce upon the ability of a licentiate to perform his duties? Under such circumstances hundreds of men must be let loose upon the community capable of accomplishing any amount of irreparable injury.

The questions quoted above are only such as any junior medical student could answer. Their correct solution certainly in no way qualifies a man for the responsibilities of tooth-preservation. Let us hope in the near future that dentists desiring to become lawful practitioners in South America will be examined by members of their *own* profession, and that the *dental* examination may begin where the present examination ends. The Argentine Republic has seen fit to adopt the United States system of common-school educa-

tion, acknowledging its superiority to every other. Why not extend the same courtesy to United States dentistry, whose superiority is even more universally acknowledged? Such a course would be certain to stimulate dental association and elevate dental practitioners to the level of scientific men.

The question may now be asked, Why is it, in view of the above assertions, that so many who go to South America as young men fail, and return to the United States thoroughly disgusted with the country and almost penniless? To this I answer that, in the first place, the *native* students who come to the United States, when *they* graduate, almost invariably return, and they do *not* fail; secondly, the English-speaking graduate will not thoroughly master their language. He speaks Spanish in such a broken, bungling manner that patients cannot believe that he understands his *own* language, and will not give him their confidence. Again, when he finds the people to be of a different disposition to what he is accustomed, he allows himself to be overcome by home-sickness. Then, he too often goes there as a single man; and this fact alone will excite more suspicion against him than if he were under the ban of heresy. He is thereby injured in the spirit of a jealous people, who cannot believe that bachelorhood is a sufficient guarantee for so serious a trust as professional relations demand, and he is injured in his own spirit, since it is certainly impossible for him to have the feelings of a *man* unless he is performing the functions of a man.

And so might be mentioned many other causes of failure that would hold good not only in South America but any other part of the world. I have endeavored to give an impartial account of matters as they stand, but, rather than extend this paper, prefer that further information should be evoked by discussion, instead of continuing a subject that might easily consume the entire evening, and even then remain unexhausted.

In conclusion, gentlemen, permit me to express to the society my sincere thanks for the interest it has manifested in this subject. When Dr. Walker called upon me and requested me, in your behalf, to address the society on the subject of dentistry in South America, that request was entirely unexpected. There are many excellent dentists whose long experience could inform you, through correspondence, much more fully than I. For example, Dr. Hastings, of Rio Janeiro; Drs. Prince and Bourse, of Montevideo; Drs. Webster and Newberry, of Buenos Ayres, and Dr. Dunster, of Assumption, in Paraguay. But this request has shown me that your sphere of sympathy is not circumscribed, and that no spot where dental suffering exists is too remote or too insignificant to enlist your attention and claim the consideration of our society.

Discussion.

President Carr. Gentlemen, this valuable paper is now open for discussion. I hope you will all have something to say.

Dr. C. S. W. Baldwin. Mr. President, I think it would be very interesting if Dr. Flagg would give us some information in reference to the fees obtained in that country, what the general success of American dentists is, and how the field compares with others in that respect.

Dr. Flagg. Gentlemen, many of you who get from fifty to a hundred dollars for filling a tooth might think the fees in South America small. Where paper money exists the smallest gold filling is usually ten dollars. Large gold fillings are seldom made, seldom desired or submitted to. Their apparatus is usually not sufficient to do large gold fillings, except in the largest cities; and there I have not heard of men getting more than forty or fifty dollars for the largest. Extracting brings two dollars where paper money is in vogue, and one dollar where gold is the basis. Gold filling, where gold is the basis, is from $7.50 to $25 and $30. Of course, I am quoting the best prices. There are many who work just as low as you can work here. Many a man will go into the office of an American dentist, remain three months, then demand an examination from the medical board, and commence practice as a dentist. South America is full of such.

There is one thing that should be corrected. All over South America you are met by Buchanan diplomas. The American and English consuls have asked me about them. They say, here are these big diplomas, finished up in blue and gold, coming from the United States, from Philadelphia, and when we come to examine the men who hold them we find that they cannot even speak English. We don't see how they graduated. There are a great many of those diplomas going around, and they produce the impression that every American diploma is valueless. I believe there has been published a list of the so-called graduates of that college, and it would be a charity to the people of South America if that list could be distributed among the medical faculties there. In speaking of those medical faculties I may have used severe language, and I ought to say that they have done the best they can; they have never seen anything different. Americans are so overpowered there that they fail to assert their rights. I have seen there men who have as handsome establishments as any in New York, perhaps, when they come to administer nitrous oxide exhibit great timidity and fear, seeing dangers that never existed; exciting their patients, who are coming out from the influence of the anesthetic and should be let alone, by having batteries at their side, and all that, when there is no danger

whatever. These things may be corrected later, but without a strong dental association I do not think it is possible. Some of the questions asked me on my examination show thought, as, "Why is a tooth of a yellowish cast stronger than one of a whitish cast?" The good and the bad is all mixed up together in that way.

Where I have been continuous-gum work has never appeared. I introduced zylonite myself. The fee for that is two hundred dollars for an upper and under set. I presume that, if prices were well maintained, continuous-gum work would bring three hundred dollars for an upper and lower set. In estimating these prices you must remember that you do not have to pay, in many parts, more than fifty to eighty dollars a month for house rent; and, what is better, you can provide your family with large roasts of beef for twenty cents the entire roast, and buy a quarter of lamb for twenty cents, and many other things in proportion. And you have not to guard yourself from the cold of terrific winters nor the scorching heat of summer. You are not obliged to pay high prices for ice. A man who goes there under good circumstances, who gets married and don't fight the people continually, is usually able to lay up something. Some dentists there are considered as possessing $150,000, acquired in ten or fifteen years. I do not think you can show anything much better than that in North America.

Adjourned. B. C. NASH, D.D.S., *Secretary.*

NORTHWESTERN DENTAL ASSOCIATION.

THE Northwestern Dental Association held its fourth annual meeting at Fargo, Dakota, July 27 and 28, 1886.

Very pleasant and profitable sessions were had, and the following officers elected for the ensuing year: H. L. Starling, president, Fargo; and S. J. Hill, secretary, Fargo.

FIFTH DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

THE Fifth District Dental Society of the State of New York will hold its eighteenth semi-annual meeting at the Vanderbilt House, Syracuse, N. Y., on Monday, October 25, 1886, at 2 P. M.

Members of the profession from other societies are cordially invited to be present and take part in the discussions.

C. J. PETERS, D.D.S., *Rec. Sec.*, Syracuse, N. Y.

OHIO STATE DENTAL SOCIETY.

THE second annual meeting of the Ohio State Dental Society (reorganized) will be held in Toledo, Ohio, beginning Tuesday, October 26, 1886, at 10 A. M. J. R. CALLAHAN, *Secretary*, Hillsboro, Ohio.

CENTRAL ILLINOIS DENTAL SOCIETY.

The fifth annual meeting of the Central Illinois Dental Society will be held at Peoria, October 12, 13, and 14, 1886.

A cordial invitation is extended to all.

Wm. A. Johnston, *Secretary*,
430 Main street, Peoria, Ill.

NEW ENGLAND DENTAL SOCIETY.

The twenty-fourth annual meeting of the New England Dental Society will be held at the rooms of The S. S. White Dental Manufacturing Co., No. 160 Tremont street, Boston, Mass., on Thursday and Friday, October 7 and 8, beginning on the first day at 10 o'clock A. M.

All reputable members of the profession are invited tc attend. An effort will be made to secure free return tickets on all railroads.

A. M. Dudley, *Secretary*,
Salem, Mass.

CONNECTICUT VALLEY DENTAL SOCIETY.

The twenty-third annual meeting of the Connecticut Valley Dental Society will be held at the Windsor House, Holyoke, Mass., October 14 and 15, 1886.

The committee have arranged to make this meeting one of interest and profit to all.

Geo. A. Maxfield, D.D.S., *Secretary*.
Holyoke, Mass.

CALIFORNIA STATE BOARD OF DENTAL EXAMINERS.

The next regular meeting of the California State Board of Dental Examiners, for examination of candidates, will be held at Red Men's Hall, Post street, San Francisco, November 2, 1886, at 10 A. M.

C. W. Hibbard, *Secretary*,
202 Stockton street, San Francisco.

EDITORIAL.

FIRST DISTRICT DENTAL SOCIETY.

The programme for 1886–87 just published by the First District Dental Society of the State of New York is a beautiful specimen of modern perfection in typography and paper. The list of papers specially prepared for the society evidences a commendable diligence on the part of the executive committee, with gratifying results. The society is to be congratulated on having so efficient a committee to lay out its work, and the profession, also, on the breadth and

scope of the subjects to be brought to their attention. The titles of the papers, with the names of the authors, are announced thus early that all who attend may be prepared to take part in the discussions. In addition to the regular meetings, a number of special meetings are to be held, at dates to be fixed hereafter, when clinics and papers will be given by prominent members of the profession. The programme for the regular meetings is as follows:

Tuesday evening, May 4th, 1886.—E. Parmly Brown, D.D.S.: "Crown and Bridge-work."

Tuesday evening, June 1st.—E. M. Flagg, D.D.S.: "Dentistry in South America."

Tuesday evening, September 7th.—Wm. H. Atkinson, M.D., D.D.S.: "The Evolution of Preserving Teeth by Filling—Materials and Methods." Wm. Carr, M.D., D.D.S.: "Some Observations on the Herbst Method."

Tuesday evening, October 5th.—Horatio C. Meriam, D.M.D.: "Gutta-percha and its Use in Operative Dentistry." Edward C. Kirk, D.D.S.: "A Contribution to the Etiology of Erosion."

Tuesday evening, November 2d.—E. R. Swartwout, D.D.S.: "The Preparation of Cavities and Filling with Crystal Gold." C. N. Peirce, D.D.S.: "The Recuperative Power of the Tooth."

Tuesday evening, December 7th.—R. B. Winder, M.D., D.D.S.: "Oral Surgery in its Relations to Dentistry." J. Edward Line, D.D.S.: "Rhythmic Character of Functional Activity in Teeth."

Tuesday evening, January 4th, 1887.—Frank Abbott, M.D.: Subject to be announced. C. Heitzmann, M.D., and C. F. W. Bödecker, M.D.S., D.D.S., to take part in the discussion.

Tuesday evening, February 1st.—A joint paper will be read. Subject—"Progressive and Retrogressive Metamorphosis in Tooth-substance." W. Xavier Sudduth, M.D., D.D.S., F.R.M.S., will present the Biological phase. W. D. Miller, A.B., Ph.D., D.D.S., Berlin, Germany, will present the Pathological part.

Tuesday evening, March 1st.—Dr. George W. Melotte will clinic in the afternoon and read a paper in the evening. Subject—"Methods Involved in the Construction of Crown and Bridge-work." J. Howard Reed, D.D.S., M.D.S.: "The Teeth of the Basket-makers."

Tuesday evening, April 5th.—Election of officers.

EDUCATIONAL DOCUMENTS WANTED.

We have received the following communication from Dr. Abbott, with request for its publication:

The undersigned is desirous of obtaining all bills, charters, statutes, statistical records, books, pamphlets, or documents, relating directly or indirectly to dental education, examination, qualification, etc., the receipt of which, from any source, will be acknowledged with thanks, and postage or other expenses paid.

Frank Abbott, M. D.,
No. 22 West Fortieth street, New York, N. Y.

MARYLAND DENTAL LAW.

The act governing the practice of dentistry in the State of Maryland was published in the Dental Cosmos for June, 1884. This law was criticised on account of the requirement that a diploma qualifying to practice in that State without examination must have been issued from a university or college chartered by or under the laws of Maryland. The dental examiners of Maryland called a mass meeting of the dental profession of the State and submitted amendments, which were unanimously indorsed. The Legislature of 1886, in response to this action, repealed sections 1 and 8 of the law of 1884, and enacted the following, as recommended by the mass meeting of the profession, This was approved April 7:

Be it enacted by the General Assembly of Maryland: That sections one and eight of the act passed at the January session, eighteen hundred and eighty-four, entitled "An act to insure the better education of practitioners of dental surgery, and to regulate the practice of dentistry in the State of Maryland," be and the same is hereby repealed and re-enacted, so as to read as follows:

Section 1. That it shall be unlawful for any person, who is not at the time of the passage of this act engaged in the practice of dentistry, to practice dentistry unless he or she shall have obtained a certificate as herein provided, or shall hold a diploma from a university or college authorized to grant diplomas in dental surgery; any person holding such a diploma, and desiring to commence such practice, shall present the same to the Board of Examiners created by this act for approval; such examining board, being satisfied as to the qualifications of the applicant and the genuineness of the diploma, shall endorse the same as approved, and issue the certificate of registration provided for in this act.

Section 8. That nothing shall be so construed as to interfere with the rights and privileges of resident physicians and surgeons in the discharge of their professional duties.

BIBLIOGRAPHICAL.

A System of Practical Medicine by American Authors. Edited by William Pepper, M.D., LL.D.; assisted by Louis Starr, M.D. Vol. V.—Diseases of the Nervous System. Imperial octavo, 1276 pages and index. Philadelphia: Lea Brothers & Co., 1886. Price, cloth, $5.00; leather, $6.00; half Russia, $7.00. For sale by subscription only.

The fifth and concluding volume of this grand work gives, with those which preceded it, the entire subject of practical medicine treated by representative American physicians. The number of articles in the five volumes is one hundred and eighty-five, written by ninety-nine authors, and covering with indexes about fifty-six hundred pages.

In this as in the preceding volumes the original purpose seems to have been rigidly adhered to, and with the result of presenting a "System of Medicine" the practical character of which adapts it to

the needs of the general practitioner. Nothing comparable to this work has ever before been attempted, and the outcome of the enterprise reflects vast credit upon authors, editors, and publishers.

The present volume contains forty-four chapters, by twenty-three authors. They are as follows: Drs. John Ashhurst, Jr., P. S. Conner, Edward P. Davis, Robert T. Edes, Chas. F. Folsom, Allen McLean Hamilton, William Hunt, Mary Putnam Jacobi, Morris J. Lewis, James Hendrie Lloyd, Henry M. Lyman, Francis T. Miles, Chas. K. Mills, Francis Minot, S. Weir Mitchell, James J. Putnam, H. D. Schmidt, Edward C. Seguin, Wharton Sinkler, E. C. Spitzka, M. Allen Starr, James C. Wilson, and Horatio C. Wood.

Dental Science: Questions and Answers on Dental Materia Medica, Dental Physiology, Dental Pathology and Therapeutics. By Lumon C. Ingersoll, A.M., D.D.S. Octavo, cloth, pp. 136. Interleaved. Keokuk, Iowa, 1886.

The author has endeavored to condense within somewhat narrow limits a great deal of information, embracing the essential parts of four branches of dental science. As a text-book in the style of a catechism it is perhaps open to the criticism that such a work is liable to lead the student into a narrow habit of study, or that it may offer an easy means of coaching for examinations. While there can be no question as to the advantage of the broadest general culture preliminary to the study of a specialty, yet a work of this kind when systematically and carefully written, as this little work in many respects is, should be a valuable assistant to the industrious student. It is, however, to the practitioner as a book of ready reference that such a work commends itself.

The author has performed his work well, and while it is not above criticism in some directions, yet it must be borne in mind that it is a compendium and not an exhaustive discussion of the subject of which it treats; still there are crudities in it which we hope to see corrected in a future edition. It would have been better, in the consideration of remedies, such as oil of cloves, for example, to give all of the effects usually expected from its exhibition. To the question, "What are its effects?" the answer is, "A prompt and active stimulant and astringent;" yet on page 107 the treatment recommended for "acute inflammation of the root membrane" is "capsicum and oil of cloves, the latter as a pain-obtunder." Oil of cloves is by many dentists considered a local anesthetic, and in that capacity is employed in pulp exposures, where for the relief of toothache it has perhaps no superior.

No mention is made on page 107, "treatment of acute inflammations of pulp-membrane," of aconite, a remedy which is considered

of great value for its sedative and local anesthetic properties in the treatment of acute inflammation. But while in some directions the author might have gone further, it cannot be said that his work is in any sense misleading, and with the correction of some few defects it will doubtless be regarded as a valuable addition to dental literature.

C. J. E.

TRANSACTIONS OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA. Third Series. Volume the Eighth. Octavo, pages 460. Philadelphia: Printed for the College, by P. Blakiston, Son & Co., 1886.

This is another valuable addition to the series of volumes published by the College of Physicians. It contains memoirs of Drs. John L. Atlee and George Hamilton, and thirty-four papers on practical and scientific topics, with a number of illustrations.

HINTS AND QUERIES.

HYDRONAPHTHOL—A NEW ANTISEPTIC.*—Hydronaphthol is a non-poisonous, non-corrosive antiseptic and disinfectant. It has a slightly perceptible aromatic taste and odor, and crystallizes in scale-like clino-rhomboid laminæ, of a silvery-white or grayish hue, resembling zinc-bronze. It is a derivative of the hydroxyl substitution of naphthalin. Within the last two years it has been discovered that this substance possesses antiseptic properties, and the claim is made that it is from ten to fifteen times more efficient than carbolic acid, being the most promising antiseptic of the phénol series. As an antiseptic, it is about one-fifth as powerful as the mercuric chloride; from one and a half times to double the strength of iodine, and four times as strong as sulphurous acid. Carbolic and salicylic acids follow in the list of antiseptics, and it is thirty times as powerful as the latter.

Hydronaphthol possesses many advantages over carbolic acid, for besides its being non-poisonous and non-corrosive, it is a non-irritant. Its odor is not sufficiently strong to disguise that of putrefaction, as it happens with carbolic acid. It is not decomposed or rendered inert by the products of putrefactive decomposition, and this property renders it invaluable in disinfecting pulpless teeth, besides its being far more stable than carbolic acid, not being volatile at ordinary temperatures.

Hydronaphthol is only soluble in water to the extent of one part in one thousand, but even in this proportion it is a powerful antiseptic, while a solution of one to ten thousand prevents putrefactive decomposition. It is freely soluble in alcohol, ether, benzol, glycerin, and the fixed oils.

I have been experimenting with this substance, and have kept a careful record of the treatment of twenty-three cases of pulpless teeth, and the satisfactory results so far obtained prompt me to call the attention of the profession, through the DENTAL COSMOS, to the valuable characteristics of this new antiseptic,

My modus operandi is as follows: Dissolve the hydronaphthol in glycerin, and introduce a saturated cotton pellet into the pulp-canal, which has already been prepared in the usual way. One application alone seems to act as a radioal specific. All soreness, if there be any, disappears in the course of twenty-four hours, as also all traces of putrefaction. At the second sitting, remove the dressing, syringe with tepid water, and proceed to fill the canal permanently with cotton, saturated with

* I am indebted to Dr. George R. Fowler, of Brooklyn, for the facts regarding the composition, properties, and relative strength of hydronaphthol in comparison with other antiseptics.

oxyphosphate and hydronaphthol. This is accomplished by mixing some thin oxyphosphate, to which is added one-fourth the quantity, by bulk, of hydronaphthol.

In cases of chronic alveolar abscess, force the hydronaphtholated glycerin through the point of discharge, using for this purpose Dr. R. W. Starr's exhaust syringe, which is very essential in the proper treatment of alveolar abscesses, and fill the canal as before stated. I have been successful in curing alveolar abscesses of long standing in this manner, and have not had a single case of recurrence.—Francis Eschauzier, D.D.S., Brooklyn, N. Y.

Power of an Operator Over a Patient Under the Influence of Nitrous Oxide.—I have been using nitrous oxide gas in my practice for a number of years. For the first two or three years I had but indifferent success, especially when called upon to remove the wisdom-teeth or second molars. To insure the mouth being open, I used to employ a rubber gag, sometimes substituting for it a large cork with a string attached. In a majority of cases, when the gag was taken out the jaws closed somewhat and remained rigid; no proper amount of force sufficing to open the mouth until the effect of the gas was nearly spent. I finally declined to administer gas for extracting teeth back of the first molars.

Requiring the extraction of a tooth from my own mouth, I went to a brother dentist and had the gas administered. While taking it and while under its effects I was perfectly conscious; heard every word said, but was powerless to move a muscle. I knew when the inhaler was removed and the forceps taken up and adjusted, but felt no pain. The tooth was broken off, and two more ineffectual efforts were made to extract it. Still there was no pain. At this instant I regained control of myself, retaining a knowledge of all that had transpired.

This experience impressed me with the conviction that if patients heard and understood they could be made to obey. It had been a habit with me to test the condition of my patients during the inhalation of the gas by requesting them to raise the left arm. They usually responded, some continuing to raise and lower the arm until the effect of the gas passed off, seeming to be impressed with the idea that they must do so.

The next occasion I had to administer gas I made the usual examination of the mouth, and, after learning which teeth I was required to remove, I turned abruptly to the patient, and said, "If, while you are under the influence of the gas, you hear me request you to open your mouth, do so. You can if you understand now that it will be necessary." I said nothing about raising his arm, but just as I thought he had inhaled enough gas I said, "Raise your left arm," and was surprised to see that, instead of doing so, he promptly opened his mouth wide. As his breathing indicated that he had enough gas, I dropped the inhaler and extracted the teeth. After he regained consciousness I said, "Did you hear me ask you to raise your arm?" He said, "I heard you tell me something, and as you had charged me to open my mouth if asked to, I thought that was what you wanted."

I have taken advantage of this experience ever since—some three years—and have yet to meet the first failure. After charging a patient to respond by opening the mouth when told to, I proceed to administer the gas, and just before he passes under its influence I say, "Remember and open your mouth when I tell you to." Thus the last thing the patient thinks of is opening his mouth, and almost invariably it is the first thing he does. I have tried the command without previous instruction, and failed to obtain a response. I think this suggestion worthy of investigation by those who use gas.—W. C. Bunker, Oregon, Ill.

THE

DENTAL COSMOS.

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ORIGINAL COMMUNICATIONS.

HYPEROSTOSIS OF ROOTS OF TEETH.

BY FRANK ABBOTT, M.D., NEW YORK, N. Y.

(Read before the American Dental Association, at Niagara Falls, August 4, 1886.)

UNDER the term "hyperostosis" I propose to consider all the forms of pathological new growths of cementum, including what authors are wont to term osteoma, exostosis, hypertrophy of the cement, etc.

As to the cause of this not very infrequent disease, the following points may be enumerated:

A. Direct irritation of the pericementum through slight long-standing caries of the crown or neck; or, exposure of the pulp, mainly the result of caries.

B. Localized irritation of the pericementum of constitutional origin, such as from gout and syphilis.

C. Irritation of the pericementum of upper teeth after the removal of their antagonizing teeth of the lower jaw, the result of or induced by gravitation.

Obviously, irritation of the pericementum is considered by all authors as the cause of outgrowths of cementum.

All tumors are considered as the result of a chronic irritation of the mother tissue; not sufficiently intense to produce symptoms of inflammation, with its typical termination into hypertrophy, or, should suppuration have preceded, into cicatrization. Tumors are unlimited growths, caused probably by a constant local irritation, first of the mother tissue, and later on of the already formed tumor itself. Recently ~~the~~ theory of the late Cohnheim has attracted ~~no little~~ attention; ~~viz., that~~ "all tumors are the result of a misplacement of embryonal germs." Unquestionably such a misplacement may occur, but in many instances they either are not traceable, or embryonal tissues may be found misplaced in normal tissues, without ever having given rise to the formation of a tumor. That a chronic irritation of the pericementum, whatever the cause may be, may result in a new formation of cementum, nobody will doubt;

nay, it has been clearly proven by Bödecker that a circumscribed hyperostosis of the cementum may arise from chronic pericementitis. The question, however, is, can a diffused enlargement of the cementum occur in consequence of pericementitis, either of a local or constitutional origin, after the cementum has once been fully formed? This question I feel constrained to answer in the negative, and I base my opinions upon microscopical studies of such tumors. My conviction is that hyperostosis of cementum of a diffused character is *in most instances a fetal malformation.*

If a carious tooth be extracted, and the roots be found in a hyperplastic condition, the first impression, of course, would be that the inflamed pulp in this case has led to pericementitis, and the latter to hyperostosis of the roots. This undoubtedly in some instances may be the case, more especially when the process of caries has attacked a lateral surface of the crown or the neck of a molar, and the root or roots nearest to the point of irritation of the pulp are found to be enlarged; but if all the roots of a molar are uniformly enlarged, or fused together, we hardly feel justified in stating that caries was the primary and hyperostosis of the roots the secondary cause, or the result of such a primary cause; for it is possible that the hyperplasia of the roots has been present long before the caries made its appearance. The latter assumption becomes almost a certainty when, upon grinding such teeth for microscopical research, we find either that the caries has not penetrated sufficiently deep to cause inflammation of the pulp, or the dentine is found in a condition which could not be the result of simple "eburnitis," but can have been the result only of a malformation at the beginning of its growth in fetal life.

After a careful study of a large number of specimens of hyperostosis, I feel entitled to the statement that such teeth were sound and their pulps alive at the time when the bony growth had formed. I would therefore question the statement of Dr. Barrett, in his paper entitled "Exostosis," recently read before the Connecticut Valley Dental Society.

Whenever a tooth becomes deprived of its nourishment from the pulp, I doubt the possibility of an osseous new formation upon the cementum; and, further, should such a new formation have existed previously, its growth has undoubtedly ceased the moment the life of the pulp was gone. Should a dentist extract a sound-looking tooth to relieve excessive pericementitis, or neuralgia suspected to arise from pericementitis, and find the root or roots considerably enlarged, he would hardly be justified in concluding that the pericementitis and neuralgia had caused the growth upon the roots; but, on the contrary, he would naturally conclude that the growth had

been the primary and the pericementitis and neuralgia the secondary features of the disease. If a large number of sound-looking teeth be removed from the same person's upper jaw, for instance, to relieve neuralgia, the roots of all of which are found to be considerably enlarged, we conclude that these roots were malformed at the earliest stage of their development. I have in my possession six upper molars, all removed from the same person's mouth, to relieve neuralgia, the roots of all of which are more or less enlarged; three of them have no decay whatever in their crowns, and the other three are but slightly affected. At the time of birth only the crowns of the temporary teeth are found to have been formed, and nothing is known as to the exact period of beginning of the formation of cementum upon the roots; probably it is during the first year of extra-uterine life, the process beginning upon the permanent teeth several years later.

Cementum being identical in its construction with bone-tissue, we are safe in concluding that their development is likewise identical. Bone, the same as any other tissue, originates or is built from medullary or embryonic tissue. It makes no difference whether cartilage is formed first, as in the lower jaw-bone, or fibrous connective-tissue, as in the flat skull bones; the changes in order to produce bone are the same—each is first converted into medullary or embryonic tissue, from which the bone proper is formed. Some of the older authors (Tomes, Shelly, and others) adhere to the theory that medullary corpuscles (osteal cells) "secrete or accumulate about them an outer investment of basis-substance, and afterward, being hollowed out, form the lacunæ, while the canaliculi are made on the plan of pore-canals of plants. To-day we know that the lacunæ contain living protoplasm, the so-called bone-corpuscles, and the canaliculi hold for tenants delicate offshoots of the bone-corpuscles,—*i. e.*, fibers of living-matter. To-day we also know that the basis-substance arises from medullary corpuscles, the same as the bone-corpuscles themselves. The theory of secretion of intercellular substance is a theory of the past. All good and reliable observers agree that only one portion of the protoplasm is transformed into basis-substance, viz., the lifeless liquid, which changes into a solid glue-yielding mass, which forms the matrix and is the seat of infiltration of lime-salts, the living protoplasm remaining unaltered in the bone-corpuscles, and its *living* portion of their offshoots is preserved in the basis-substance within the canaliculi. No growth of any tissue is possible without its being first partially reduced to medullary elements. An augmentation of the cementum is impossible without a preceding augmentation of the medullary tissue, which again is caused by increased nutrition, or, as it is generally expressed, an irritation. Bōdecker has demonstrated that in normal cement the lacunæ contain protoplasm, a portion of which is living-matter, and that the

whole basis-substance is traversed by a delicate reticulum,—far more delicate, indeed, than previous observers have thought canaliculi to exist. This reticulum contains the threads of living-matter in a cobweb arrangement. Thus, it was proven that the cementum is not an inert mass, a deposition of lime-salts, with hollow lacunæ and canaliculi.

I propose to show that cementum, in a pathological (hyperplastic) condition, is endowed with properties of life the same as in normal cementum. Thus it becomes explicable that hyperplastic cementum itself may become the subject of pathological processes, particularly of inflammation. Hyperplastic cementum may and often does become partially destroyed by cementitis and transformed into medullary tissue, from which, evidently, an additional new growth of cementum may start.

It is only the knowledge that cementum is a living tissue *all through* that enables us to understand the process of its development, its growth, its enlargement, its destruction, and its re-formation.

Since the beginning of the present century a good many reliable observers have described and depicted anomalous teeth with hyperostosis in varying degrees of development. Some of these illustrations are striking examples of the excessive growths to which cementum may attain, and still be tolerated by the sufferer. All observers and clinicians, I think, generally agree that this disease attacks bicuspids and molars only, incisors and cuspids appearing to be exempt; and, again, the teeth of the upper jaw are more frequently affected than those of the lower.

Facial neuralgia of the most severe and unyielding character is frequently caused by these malformations. At the same time the symptoms which point to a diagnosis of hyperostosis of the roots are not very marked. When observable at all, however, they consist of a slight continued uneasiness in the jaw (as sometimes expressed by a patient, "I can't call it real pain, but I am *constantly* aware that I have a tooth in that locality"). It is akin to pain, with slight soreness of the tooth or teeth upon biting, while excessive pressure upon it in any direction is productive of quite severe and prolonged pain. Eventually the soreness becomes more marked, and the pain constant or intermittent, and finally terminates in possibly an abscess, severe mental derangement; or the removal of the tooth as a cure.

It is not infrequently the case that a patient suffering from neuralgia applies to a dentist to have a certain tooth extracted for relief, the case being to the dentist so obscure that he takes the patient's word for it, and takes the tooth out; but to his disgust the patient, after a few moments, turns to him and says, "Why, doctor, that isn't the tooth; the pain is just as bad as it was before you took it out." This operation is repeated over and over again with the

same result, until finally, perhaps, it is the last tooth in the jaw which when taken out, reveals the cause of this long suffering, in an enlarged root or roots from hyperostosis. A peculiar feature in these cases is the long-continued and most distressing pain that follows such extractions, relief coming but very slowly.

As custodian of that portion of the museum of the New York College of Dentistry which pertains to my department, I have come into possession of seventy odd teeth exhibiting hyperostosis of the roots, and this comparatively large number prompts me to try to classify the different varieties as they occur to me. I will here add that about one-third of these teeth are sound or very nearly so. Previous authors have simply described different forms, more or less striking, without observing any system in the arrangement.

I. Circumscribed Hyperostosis.

Under this title is included osteoma and exostosis of the authors, which are characterized by an outgrowth of bone-tissue from the cementum, of a limited size, varying from that recognizable with the microscope only to that of a lentil or a pea. Their surfaces usually

Fig. 1.

a. *b.*

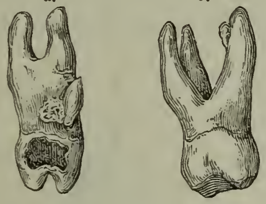
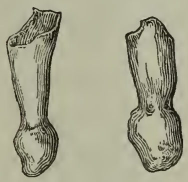


Fig. 2.

a. *b.*



present a nodular appearance, and sometimes they are adjacent to newly-formed cancellous structure of bone, evidently caused by osteitis of the socket. I would subdivide this group into:

A. Osteoma on the body of the root (Fig. 1, *a*, *b*).

B. Osteoma on the apex of the root (Fig. 2, *a*, *b*).

Either of these appears mostly upon teeth the crowns of which are more or less destroyed by caries, with probably a long-standing exposed pulp, which plainly indicates that their cause is likely to be accounted for in localized pericementitis from this source. If, however, we bear in mind that the destruction of the life of the pulp prevents or stops the formation of osteoma on the roots, we must come to the conclusion that such tumors had commenced their formation long before the exposure of the pulp, or it must have remained alive for a very long time after its exposure before it died, causing during this long time a slight but constant irritation of this tissue, transferred to the pericementum.

As soon as severe pericementitis sets in fron an exposed pulp, unless vigorous steps for its relief are taken, the pulp is in a fair way to become lifeless very soon. After its death severe pericementitis and its distressing terminations are too well known to practitioners to need mentioning here. In neither of the latter instances would we expect a bony outgrowth on the roots. It is only an irritation of the pericementum while the pulp is living that, in my judgment, can result in an *increased* cementum.

In some persons, or conditions of persons, a very superficial decay, more particularly upon the necks of teeth, will produce marked pericementitis and neuralgia. We may infer from this fact that in other persons or conditions (or possibly the same), perhaps under the influence of constitutional disturbances, a local irritation of the pericementum is induced, causing exostosis, long before exposure of the pulp had occurred.

II. Diffused Hyperostosis with Roots Separated. (Fig. 3, *a*, *b*, *c*.)

Under this heading a large number of specimens of my collection can be summed up, either of otherwise sound teeth or those decayed or filled. From what I have stated before, I will admit that pericementitis from caries is a cause of hyperostosis only when

Fig. 3.

a. *b.* *c.*

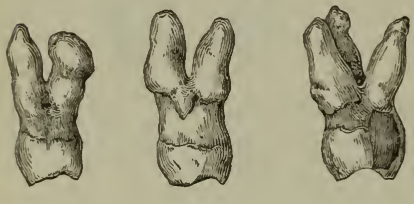
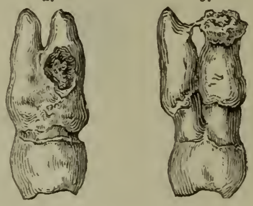


Fig. 4.

a. *b.*



one root or two be involved, and others in a normal condition, and the enlarged root or roots corresponding to the carious cavity either on the neck or crown of the tooth. When all the roots of molars are affected, without the least symptom of disease upon the exposed portion of the tooth in the mouth, I can see no other correct course but to seek for the cause of malformation in the beginning of the formation of cementum, to wit, during the first year of extra-uterine life. Hyperostosis of this kind invades the roots from the apex to the middle, to two-thirds their length, sometimes even to their necks. The enlargement is either blending with the crown, without a distinct boundary line, or there is a more or less marked bulging of the augmented tissue. The enlarged portion is either in

a more or less horizontal line or is fluted, with here and there irregular prolongations towards the crown. In one instance I have seen a small enamel nodule corresponding exactly to the summit of a marked conical prolongation of the cementum. Sometimes the bulging of the cementum reaches the crown, and may be distinctly seen overlapping the enamel. Such formations are usually either smooth or slightly nodulated. Sometimes they are corroded as if by inflammation; and, again, upon a comparatively smooth mass there may be found bulging forth an irregular nodule of circumscribed osteoma, evidently the result of an excessive formative pericementitis.

In one of my specimens, a left upper second molar, there is upon the anterior surface of the buccal root a pit two and a half millimeters in diameter and one millimeter in depth, the base of the pit being finely corroded and nodular. On the same surface numerous small nodules are scattered about. On the neck the hyperplastic cementum is one millimeter in thickness, and terminates all around it in a nearly abrupt line. (Fig. 4, *a.*)

On a right upper second molar the palatal root exhibits at its apex a cauliflower-like excrescence, upon a comparatively smooth osteoma, about one millimeter in thickness, occupying the upper two-thirds of the root. The excrescence sends a delicate conical offshoot to the mass which cements the buccal roots together. The posterior portion of the crown of this tooth has a carious cavity in it the size of a French pea, with the pulp-chamber opened. (Fig. 4, *b.*)

Roots of this kind look very clumsy and shortened, for the reason that at the place of their union the hyperostosis forms a heavier mass, which has more or less filled the space between them; still they remain separate to a considerable extent.

III. Diffused Hyperostosis with Roots United.

This group may be subdivided as follows:

A. Apices free and straight.
B. Apices free and curved.
C. All roots united their entire length.

Teeth of group A are characterized by an osseous outgrowth of cementum accumulating at the point of junction of the roots,—the roots themselves being either slender and free from osteoma or slightly thickened. An upper wisdom-tooth presenting this anomaly has five roots, three of which are normal at their apices, the fourth being the seat of a diffused hyperostosis encircling it, and the fifth root being rudimentary. All, however, are united into a com-

mon mass a short distance from their apices, which mass gradually blends with the enamel. (Fig. 5, *a.*)

Teeth of group B exhibit a union of the roots with markedly devious but slender apices. A left upper second molar of my collection shows this evidently rare anomaly. The palatal root is slightly devious, with an apex arising from the main mass of the root at a right angle. The buccal root (there is but one) shows two curvatures, both at right angles. The osteoma is only moderately large, and on the posterior surface, at the point of junction of the roots, there is wedged in a sessile oblong nodule, below which is a shallow furrow, indicating the original point of separation of the two roots. The crown of this tooth is not decayed. (Fig. 5, *b.*)

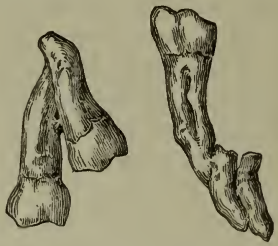
Teeth of group C are rather common. In third molars or wisdom-teeth, both of the upper and lower jaws, a union of the roots is quite

Fig. 5.

a. *b.* *c.*

Fig. 6.

a. *b.*



generally their normal condition. Osteoma, when found upon such roots, is either a clumsy nodular mass without any sign of a previous separation, or slight furrows may be visible indicative of such separation of the roots. (Fig. 5, *c.*)

There is a history connected with a lower left wisdom-tooth in my collection that I will give in abstract, feeling that it may be of interest to some who may hear or read it. It exhibits a diffused osteoma, ridged and nodulated, with a bent apex toward the ramus. It was extracted from the mouth of a lady some years since by my friend, Dr. S. A. Main, of this city, who kindly presented it to me with the following history: For some ten years this lady had suffered most excruciatingly from facial neuralgia. She consulted the best medical talent at home without obtaining the slightest relief. Finally, some three years before the tooth was removed, she went to London, where it was determined by the surgeon who was called to attend her that, in order to afford any relief, it would be necessary to sever the facial nerve upon the side which seemed the most affected, which operation was done,—with, however, only temporary relief. With the hope that the slight cessation of pain would be

speedily followed by permanent cure, she went to Paris, anticipating the pleasure of a comfortable tour of the Continent, where in a few days the pain again returned with renewed energy. She there consulted a surgeon, who decided that the only chance for permanent relief was to have the facial nerve divided upon the other side of the face. The operation was done with no better results than from the first. Finally she concluded to return to her home in New York, there to spend the few days (as she supposed) which she had to live as comfortably as possible. Shortly after arriving at her home she consulted her dentist (who, by the way, she had never thought to consult before in reference to her neuralgia), and asked him to look at this tooth, saying at the same time that it often felt quite sore to the touch. (Its antagonist had been taken out many years before.) After examination, she was advised to have it taken out, which was done. Immediately upon its removal the lady realized that the cause of her long-continued, fearfully distressing, and very expensive neuralgia had been found at last, which proved to be true. She then told Dr. Main that that tooth had cost her ten thousand dollars.

IV.—Union of Two Teeth through Hyperostosis.

Of this rare occurrence of the osseous union of teeth I have some eight fine specimens. The subdivision suggesting itself is as follows:

A. Union of the roots at their apices (Fig. 6, *a b*).

B. Union of the roots at their middle (Fig. 7, *a b*).

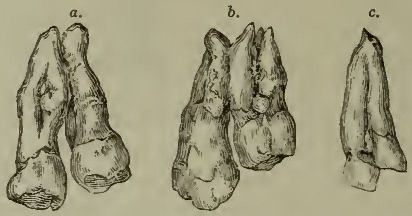
C. Complete union of the roots (Fig. 7, *c*).

The first group is characterized by a union of devious roots of neighboring teeth. As both of my specimens show a partial carious destruction of their crowns, the idea may suggest itself that, owing to a destruction of the intervening alveolar wall, and owing to gravitation, the roots became attached to each other through an inflammatory process. At the same time serious objections may be raised against such a view. The main objection is that an inflammation of the pericementum sufficiently intense to destroy the alveolus would be very liable to destroy the pericementum itself, to such a degree as to render the secondary new formation of cementum necessary for agglutination of the neighboring roots quite impossible. Should we assume that the septum was originally absent, the only way of explaining such formations is to assume that at least one of the germs of the coalesced teeth was malposed at the time of the embryonic arrangement. In this view, it will be observed, the alveolar septum did not form at all, and at the time of development of the roots the mutual pressure was sufficient to cause irritation lead-

ing to a new formation. I conclude, therefore, that the carious destruction of the crowns was merely a coincidence rather than a cause (Fig. 6, *a*). The roots of one tooth are mere stumps left after carious destruction of the crown and a portion of the roots. Here, the hyperplastic cementum of the stumps is jagged and nodular plainly indicating that the already formed outgrowth of cementum has been destroyed by cementitis in rather a secondary manner. (Fig. 6, *b*.)

Group B shows a concretion of neighboring roots of molars at the middle, upon one side, and at the apices upon the other (Fig. 7, *a*). One of the crowns is slightly affected by caries,—by no means, however, to such a degree as to account for agglutination of the two teeth, the enlarged cementum of which is mainly smooth. Fig. 7, *b*, represents two molars grown together nearly the entire length of their roots; both teeth being otherwise sound. One of them shows at its neck an "enamel-drop," which feature I consider a further proof of embryonal malformation of such teeth. Some exostoses from the

Fig. 7.



sockets are attached to the roots, which in my judgment proves merely a secondary hyperplastic pericementitis.

Group C is represented by but one specimen,—that of an upper cuspid united with a neighboring lateral incisor. This seems to be a case which may be considered an exception to the rule,—viz., that only bicuspids and molars are thus affected. In this case the union is perfect the entire length of the roots, and only shallow furrows on the outer and inner surfaces, reaching nearly to a common apex, indicate the previous separation. The apex presents but one large common foramen. At the necks of both teeth there is shallow carious destruction,—not, however, exposing the pulp-chambers. All these features furnish us proof of a fetal malformation.

For the purpose of examining this disease microscopically, I have ground quite a large number of specimens from teeth which at the time of extraction were immediately placed into dilute alcohol, in order to keep them constantly wet, and to preserve their soft parts. During the process of grinding they were also kept under water. All specimens showed in common a number of features which are

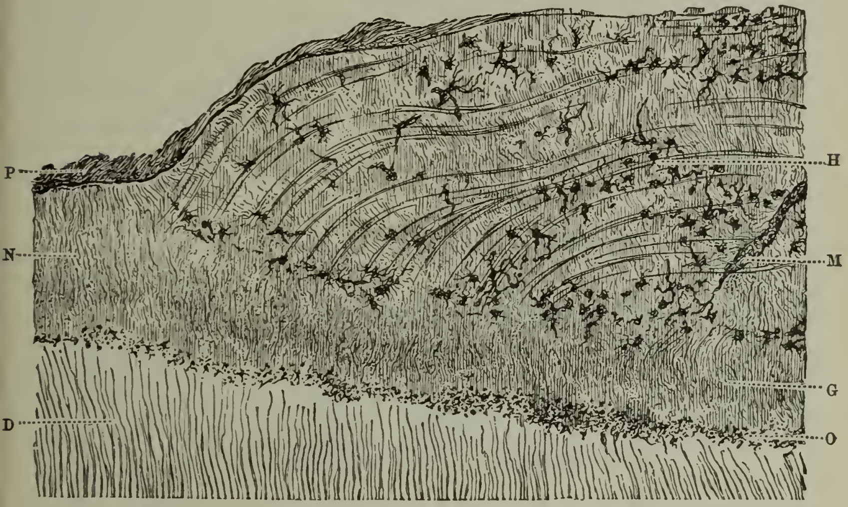
represented with a comparatively low power in Fig. 8. Those which I wish to call attention to are as follows:

The dentine in some specimens, perhaps in several localities in the same specimen, was found in a normal condition; and in others it exhibited the so-called interglobular spaces, greatly varying in size and number, indicative of an incomplete calcification.

In some specimens the dentinal canaliculi of the root were arranged in bundles, between which were found areas scantily provided with or altogether destitute of canaliculi. In these areas are often seen small interglobular spaces, sometimes in direct union with a few canaliculi.

The interzonal layer between dentine and cementum invariably exhibited formations known under the name of osteo-dentine, or globu-

Fig. 8.



Longitudinal Section of Hyperplastic Cementum slightly bulging towards the Neck of the Tooth (Upper Bicuspid.)

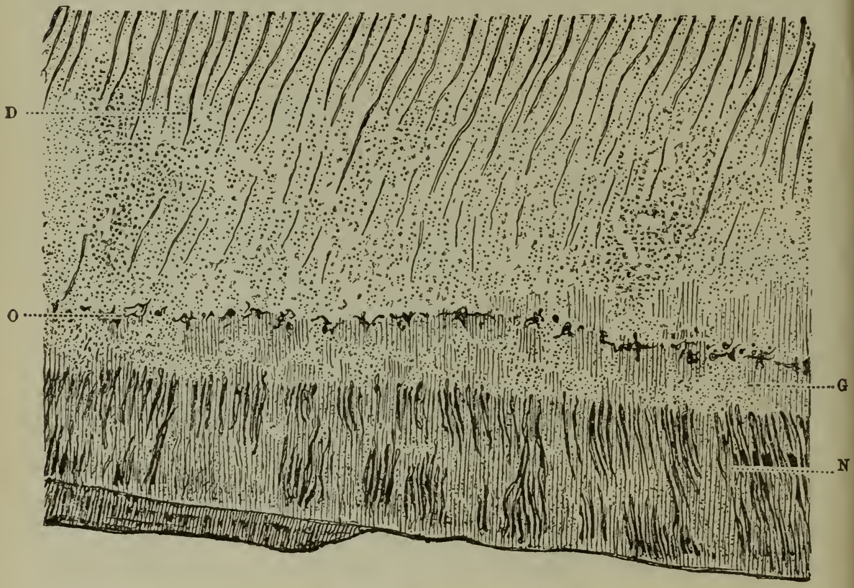
D, Dentine; N, Neck; P, Pericementum; O, Globular or osteo-dentine; G, Granular layer; H, Hyperplastic cementum irregularly lamellated, with irregularly distributed cement-corpuscles; M, Medullary canal. X 150.

lar dentine, either as the result of "eburnitis" or of incomplete calcification. It is a condition kindred to the interglobular spaces of Czermak. Such formations, as a rule, extend into the neck of a tooth,—where, however, they are more scanty than on the roots. A striking feature is their entire absence at the point of junction of the roots. Here the cementum is found in contact with an irregular formation of dentine (vaso-dentine), which will be described further

on. Wedl seems to have been the first to illustrate this formation,—without, however, making an allusion to it in his text.

Next to the layer of osteo-dentine invariably a layer is found which, under lower powers of the microscope, looks coarsely granular, and which in consequence I propose to call the granular layer. It is destitute of cement-corpuscles, and as a rule is the only layer comprising the cementum of the neck of the tooth whenever this gradually slopes from the hyperplastic cementum to the enamel. Next follows the enlarged cementum itself, usually characterized by a large number of irregular lamellæ more or less concentric to the axis of the root. Some areas may be found destitute of lamellæ;

Fig. 9.



Hyperplastic Cementum of the Neck of a Molar. Longitudinal Section.

N, Zone of coarsely-granulated cementum, traversed by bundles of coarse canaliculi; G, Granular zone, destitute of canaliculi; O, Zone of globular dentine; D, Dentine with canaliculi stopped short of the cementum. X 500.

others very richly supplied with them. At the border of the cementum toward the crown, where the former is often found bulging to a considerable extent, the lamellæ are found parallel with the outer periphery of the cementum inosculating with the granular layer at obtuse angles.

In the lamellated basis-substance are found scattered cement-corpuscles. The most striking features of these corpuscles are as follows: First, they are far more irregularly distributed in the basis-sub-

stance than in normal cementum. In some portions of the hyperplastic cementum such corpuscles are comparatively few, whether the lamellæ be plainly marked or not; in other portions they are arranged in groups or clusters without apparently any regularity. Second, the cement corpuscles, as a rule, are smallest near the granular layer, and largest toward the periphery; at the latter portion their offshoots are much wider and more irregular, often piercing the lamellæ rectangularly. No constant relation between lamellæ and cement-corpuscles is to be found. Third, occasionally the cement-corpuscles are to be seen in large numbers clustered ~~together~~ in longitudinal groups. This is probably caused by the previous presence of medullary canals, the tissue of which, at a comparatively late period, has given rise to a large number of cement-corpuscles, and a comparatively small amount of basis-substance between them.

The hyperplastic cementum is often traversed by medullary canals carrying central blood-vessels. These are most numerous at or near the point of junction of the roots, where, as first described by Tomes, even normal cementum may sometimes contain medullary canals. The vessels of these medullary canals, also first described by Tomes, with whom I am pleased to agree, are in direct connection, and anastomose with the blood-vessels of the pericementum. In one of my specimens the cementum of the neck exhibits peculiar features. Instead of the coarsely-granular layer usually present, and previously alluded to, there is a zone traversed at nearly right angles by bundles of canaliculi, very broad and in no connection ~~whatever~~ with cement-corpuscles. Above this zone follows the ordinary granular zone, bordered towards the dentine by a thin layer of globular dentine; then follows the finely-granular layer of the dentine itself, with very few or no canaliculi, and at last we come to the canaliculated dentine of normal development (Fig. 9).

High amplifications plainly reveal the structure of the interzonal layer between dentine and hyperplastic cementum. The dentine often shows interglobular spaces, which as a rule are filled with granular protoplasm, and serve as the termination of some dentinal canaliculi; especially for their tenants, their fibers of living-matter. The interglobular spaces nearest to the cementum sometimes directly inosculate with the interstices between the globular masses of calcified basis-substance, constituting the tissue termed osteo-dentine or globular dentine. The globules themselves vary greatly in size. They usually, however, correspond with the bulk of one or a limited number of medullary corpuscles present before their transformation into basis-substance. The interstices between the globules also vary in size, and send offshoots into the larger globules, subdividing them into incomplete smaller ones. All of them contain granular

2 × 450 = 900
2 × 300

protoplasm. In the granular zone following the layer of osteo-dentine we sometimes meet with very large and irregular interglobular spaces, apparently in no direct connection with the offshoots of cement-corpuscles. In several specimens I have seen arising from the cement-corpuscles very long and slightly wavy offshoots, which, owing to their parallel course, bear a close resemblance to dentinal

Fig. 10.

Interzonal Layer between Dentine and Hyperplastic Cementum of a Molar. Longitudinal Section.

D, Dentine with small interglobular spaces; O, Osteo-dentine, above which, in the granular layer G, there is a large irregular interglobular space; C, C, Cement-corpuscles with long parallel offshoots. X 600.

canaliculi. Formations of this kind occur only in those layers of hyperplastic cementum nearest the dentine, and always lose themselves in the granular layer above the osteo-dentine without directly communicating with the dentinal canaliculi proper. (Fig. 10.) The

medullary canals traversing the enlarged cementum either contain medullary corpuscles and capillary blood-vessels, or they are filled with highly-refracting granules and globules of lime-salts, as described by Wedl. Should their canals become obliterated, they give rise to groups of cement-corpuscles between a scantily calcified basis-substance.

At the point of junction of the enlarged roots I have met in several of my specimens with a peculiar formation of dentine, and owing to the presence of a large number of vascular canals I propose to term it vaso-dentine. To the naked eye, in the prepared speci-

FIG. 11.

VASO-DENTINE FROM THE JUNCTION OF THE ENLARGED ROOTS OF AN UPPER MOLAR. LONGITUDINAL SECTION.

D, Primary dentine; V-D, Vaso-dentine traversed by medullary canals in a plexiform arrangement. The canals contain either blood-vessels or glistening depositions of lime-salts. B, Basis-substance of dentine scantily provided with extremely delicate canaliculi, and in some places fan- and fountain-shaped figures of dentinal canaliculi are discernible; C, Hyperplastic cementum lamellated, and containing a medullary canal. X 50.

men, is presented a high degree of transparency, which at once distinguishes it from the neighboring opaque portions of normal dentine and from cementum. Low powers of the microscope reveal in this dentine a varying number of medullary canals, either in a parallel or plexiform arrangement. The canaliculi contain medullary tissue and capillary blood-vessels, one or two in each canal. Sometimes glistening granules of lime-salts are found, more especially in dilated portions of the canals. Offshoots of such canals may inosculate with very narrow canals, containing granular protoplasm only. The surrounding basis-substance is scantily supplied with extremely fine

canaliculi, running, without any apparent regularity, either in fan-shaped groups or parallel with the medullary canals, or in the shape of a fountain, encircling the canals in the most beautiful and striking figures. Some portions of the basis-substance may look granular and devoid of canaliculi; others (and these formed a vast majority) are apparently homogeneous, and scantily supplied with extremely minute canaliculi. The cementum is directly on the border of the vaso-dentine, without any intervening layer of granular dentine, and the cement-corpuscles nearest to the dentine are in direct connection with the dentinal canaliculi themselves. (Fig. 11.) Higher powers of the microscope brought to bear upon the vaso-dentine plainly show the medullary contents of the medullary canals, in which may also be seen one or two capillary blood-vessels. Both the canals and blood-vessels produce loops, as indicated by their abrupt terminations in vertical sections, and are unquestionably in communication with the blood-vessels of the pericementum (Tomes). A peculiar feature of the vaso-dentine is that portions freely supplied with vascular canals contain a considerably larger number of dentinal canaliculi than those devoid of vascular canals.

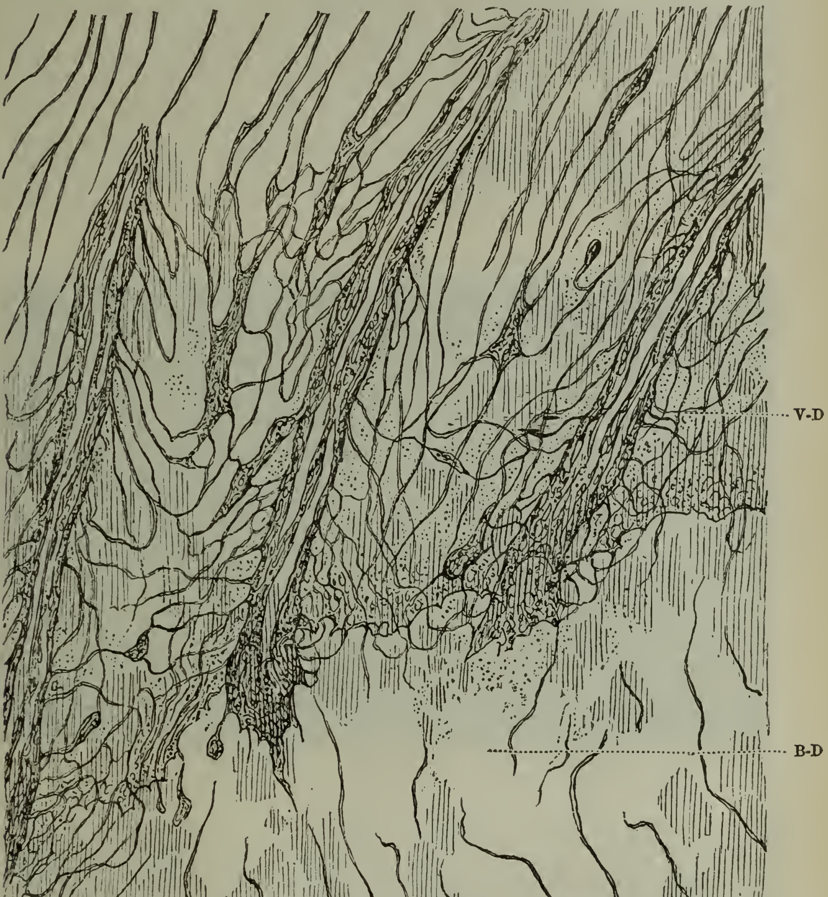
The canaliculi in the neighborhood of the vascular canals are very irregular in their course, as before stated, and often loop-shaped, starting from and inosculating with the same vascular canal. Again, we find them starting from club, pear, spindle, and irregular-shaped spaces, containing medullary corpuscles, or granular protoplasm, but no blood-vessels. (Fig. 12.) As an additional feature of hyperostosis of the roots, I would mention that in all my specimens the pulp-chamber and often the canals appear considerably narrowed by heavy formations of secondary dentine. Besides, the pulp-tissue was found to contain formations of secondary dentine known as pulp-stones, or crowded with globular calcareous depositions with no apparent structure. In the majority of the teeth the enamel also was imperfectly formed, it generally presenting a highly pigmented and imperfectly-calcified condition, with enamel-rods very irregular and curly.

A striking feature in all microscopical specimens of hyperplastic cementum is the great number and large size of the offshoots of the cement-corpuscles, the previously so-called canaliculi. The reason for this seems to be in the fact that both the corpuscles (lacunæ) and their coarser offshoots (canaliculi) are filled with air, or dirt from the grinding, which causes them to look black. If, however, we place a carefully but not completely decalcified portion of this tissue, mounted in glycerin, under a very high power, we are struck with its beautiful and graceful appearance. It is identical in structure with that of normal cementum. The basis-substance forms

cavities that contain nucleated protoplasmic bodies, the cement-corpuscles proper, of a markedly reticulated structure.

Between the periphery of the cement-corpuscles and that of the lacuna there is a narrow light rim, obviously corresponding to a

FIG. 12.



VASO-DENTINE FROM THE POINT OF JUNCTION OF THE ENLARGED ROOT OF AN UPPER BICUSPID. LONGITUDINAL SECTION.

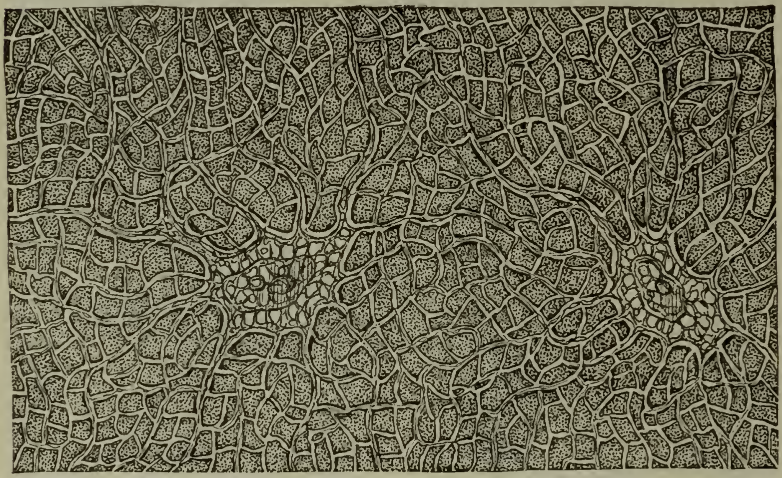
V-D, A portion of vaso-dentine with three parallel vascular canals, and very irregular, often looped, canaliculi, some starting from the vascular canals and others from smaller medullary spaces. B-D Dentine of great transparency, with scanty canaliculi. The boundary line between the two portions is abrupt, with numerous bay-like excavations. X 500.

space that serves for the circulation of the nutritive liquids. The lacuna at its periphery is interrupted by numerous offshoots, more

irregular and wider than those of normal cementum. These canaliculi form an extremely delicate reticulum throughout the basis-substance, interconnecting the neighboring lacunæ (indeed, all lacunæ) of the cementum.

Starting from the periphery of the cement-corpuscles, conical offshoots run into the canaliculi; the broader, of course, the wider the canaliculus. The coarsest offshoots still exhibit a reticular structure; whereas the finest are merely beaded threads occupying the middle of the canaliculi. Thus it will be seen that all canaliculi hold filaments of living-matter in a cobweb arrangement, and thus it becomes plain that hyperplastic as well as normal cementum is a living tissue throughout. The reticular structure of the living-matter

FIG. 13.



HYPERPLASTIC CEMENTUM OF AN UPPER MOLAR. CROSS SECTION. X 1500.

in the corpuscle itself is plainly visible. The inert basis-substance, infiltrated at the same time with lime-salts, is located in the meshes of the reticulum of the canaliculi, and between the basis-substance and filaments of living-matter a slow circulation is going on, the liquid carrying nourishment and taking away the effete material. (Fig. 13). Thus it is that pathological changes of a pathological tissue become intelligible, and cementitis of hyperplastic cementum, as described and illustrated by Wedl, under the term "perforating resorption," is understood.

Microscopically I have already described this condition. Under the microscope it is characterized by the presence of cavities filled with medullary corpuscles, or multinuclear protoplasmic masses, and

bounded toward the unchanged cementum with numerous bay-like excavations. The destruction may involve superficial portions of the tumor only, or the entire mass down to the dentine. As there is little tendency to suppurative pericementitis, the termination of the inflammatory process undoubtedly results often in a re-formation of cementum, the same as takes place during the process of absorption of the roots of temporary teeth. Under these circumstances the bay-like excavations are refilled with bone-tissue, and the bays are recognizable by sharply-defined lines corresponding to the territories of the cement corpuscles. Some of my specimens exhibit bay-like excavations directly separating the cementum from the dentine, and the bays filled with bone-tissue crowded with cement corpuscles. In other specimens certain portions of the hyperplastic cementum show distinct circular, semicircular, or crescentic lines corresponding to the territory of one or more cement-corpuscles.

Those who wish to study and know the literature of this subject I will refer to the following authors, viz: John Hunter (under the heading of "Inflammation of the Roots"), "Natural History of the Human Teeth," etc., 1778; Joseph Fox, "Diseases of the Teeth," etc., 1806; Thomas Bell, "Anatomy, Physiology, and Diseases of the Teeth," 1831; Carabelli, "Systematic Handbook of Dentistry," 1844; Wedl, "Pathology of the Teeth," 1872; J. and C. Tomes, "Dental Surgery," 1873; Garretson, "System of Oral Surgery," 1873; Bödecker, "Pericementum and Pericementitis," DENTAL COSMOS, 1879–80.

PATHOLOGICAL HEREDITY AND GOUTY TEETH.

BY ALTON HOWARD THOMPSON, D.D.S., TOPEKA, KANSAS.

(Read before the American Dental Association, at Niagara Falls, August 5, 1886.)

THE deleterious influence of hereditary diseases and of transmitted predisposition to certain diseases upon the development of the teeth is now one of the well-recognized facts of dental embryology. They induce disturbances of function in relation to the development of the teeth which are strictly pathological, and which eventuate in defects and deformities of these organs which are more or less pathognomonic; but as to *how* this is effected we are yet in the dark. It may be by perverting the nutritive fluid—either by filling the pabulum with the poison of the disease or the diseased products, or merely by causing insufficiency or poverty of tooth-forming materials in the fluids; or it may be by affecting the formative organ itself, causing the death or disruption of the building cells, which give rise to defective areas; or again, by affecting the whole organ and causing the whole crown to be imperfect or malformed.

Some observers believe that defective enamel is caused by acrid fluids acting upon it during the process of eruption, and not by defective formation of the tissue, but the evidence is yet upon the side of the congenital and follicular effects of disease, and that teeth are unaltered after formation as regards their form at least. As Magitot says, "If the alteration were chemical in its nature there would be no change in the center of the organ, but this is always present. * * * Congenital lesions of the teeth, fissures, erosion, etc., are exclusively due to disturbances of dentinification, and belong to the history of the follicular evolution."

Indeed, the study of the pathology of dental embryology is now largely concerned with the observation of transmittible diseases, which, directly or indirectly, injuriously affect the growing tooth-germs. Of course, many of the acute diseases incident to infancy, especially the exanthemata and intestinal affections, leave a legacy of markings and defectiveness which are well known to emanate from these disturbances; but as compared with hereditary influences in causing weakness in structure and deficiency in form, the latter are the most constant and powerful.

When we contemplate the whole field of pathological heredity,—of diseases directly transmitted, of predisposition to disease as well, of defective organs inherited, of weakness, debility, and enervation in all its forms, that are so prevalent and transmittible, we cannot wonder that the teeth are so often defective, but rather that they are ever perfect; for perfect physical health, in this day of the preservation and propagation of the unfit, is as rare as it is desirable.

Most transmissible diseases affect the tooth-germs—or other organs and tissues—in a particular way, so that characteristic effects are produced in the growing tooth which remain as a more or less permanent pathognomonic sign of the disease. Some of these signs—syphilitic notably—we are able to recognize, and the markings have a positive diagnostic value to the pathologist. Gout can be placed in this category also, and some other diseases, such as rachitis, scrofula, scorbutis, and tubercle, are being approached; but knowledge of the signs of these diseases is not yet perfect. There are others also which affect the development of the teeth, of which we know little but suspect much. And as the field broadens by judicious observation, our knowledge will be wonderfully developed, for there are likely yet other influences which may have a positive effect which we do not now suspect.

Here we would urge upon dental and oral specialists, especially those having access to hospital work and all institutions where persons are collected in numbers, the desirability of making observations and records regarding the effects of all diseases upon the develop-

ment of the teeth; for only by systematic observation and extensive statistics can we arrive at a just solution of this problem.

Gout is a disease which is not endemic in the United States, and only appears here when imported directly from the mother country, England. Errors in diet are punished by nature in other ways amongst this great people—the related disease, rheumatism, being one of the most efficient instruments for that purpose. We Americans suffer for our indiscretions, but not as our Anglo-Saxon ancestors did; so that we are prone to admit that the study of gout and gouty teeth has little practical value to us. The scientific interest in the question is great, however, for we have progressed so far in the investigation of gouty teeth as to place them in the same category with syphilitic teeth, as having a positive diagnostic value in determining the presence of hereditary gout.

That we may definitely understand the nature of the disease, let us glean from the authorities upon the subject such items as will enable us to intelligently consider it:

Quain defines gout as a "general or constitutional disease, probably depending upon the presence in the system of excess of uric acid, the complaint being, in fact, a manifestation of the lithic or uric acid diathesis. It may be hereditary or acquired, and is characterized ordinarily by a peculiar inflammation of the joints—*articular* or regular gout, attended with the deposit of urates in their structures, affecting usually and especially the smaller joints, beginning with the great toe. Similar deposits of urates may occur in other tissues in the course of time, and certain organs of the body are liable to become the seat of functional disorders or of pathological changes during the progress of the disease; this is *non-articular* or irregular gout.

"Gout usually begins as an acute affection occurring in fits; but subsequently tends to become chronic and permanent, though presenting exacerbations from time to time. The gouty diathesis may, however, be present without giving rise to any joint affection or other evident organic mischief. It is now generally admitted that the morbific agent producing it is uric acid, which accumulates in the system in abnormal quantities, due to imperfect elimination by the kidneys or molecular destruction, and this excess produces gout. It exists as lithate or urate of soda, which is distributed by the circulation to all the tissues of the body. In health the amount of uric acid in the blood is so minute that it cannot be detected by ordinary tests; but in gouty persons it can readily be obtained from any and all the secretions and tissues, and can be crystallized from the blood serum during severe attacks of the disease. Deposits of the urates, especially soda, are formed in the joints and other structures, and gout is the only disease in which these deposits are formed, and which are sometimes thrown off through the skin.

"Gout is one of the most striking examples of an hereditary disease, and once established it may be transmitted for several generations, and is generally intensified in progress by the continuance of the pernicious habits which induced it, thereby becoming a permanent legacy. Garrod found that in more than half his cases hereditary taint could be traced distinctly. It sometimes happens that, when gout becomes developed *de novo* in an individual, children born previously to its appearance are free from it, and those born subsequently are liable to be affected. Hereditary influence may be so powerful that gout arises without any other cause whatever; but most commonly this is aided by the habits which first led to its development. The law of atavism sometimes also operates where a generation is missed, and the disease reappears subsequently. Should the predisposition be very powerful, the complaint may appear even in children, and the younger the subject who is attacked with gout the more likely is there to be an hereditary taint.

"The principal cause of gout *de novo* is excessive indulgence in nitrogenous foods and alcoholic drinks, and deficient exercise with indolent habits, and it is largely confined to the upper and luxurious classes in England.

"Gout is exceedingly rare under twenty years, unless strongly hereditary, and is rare before thirty, the majority of cases occurring between thirty-five and forty-five, usually appearing before fifty, and very rarely occurring after sixty. Males are more frequently the subjects than females, this being due to difference of habits, and also, according to some writers, to the eliminating effects of menstruation, for when it does appear in females it is usually after the cessation of this function. But when strongly hereditary, gout may appear in young females also.

"Gout must be distinguished from acute or chronic rheumatism or rheumatic arthritis, although it is a related disease. Rheumatism occurs in earlier life, and is common to both sexes."

From the writings of those who have investigated the subject of gouty teeth, the following selections will give us a fair idea of what has been done in that direction:

Dr. Dyce Duckworth, in an elaborate article upon the characters of the arthritic diathesis, says, "London appears to be the headquarters or center of gout, and more pure, unequivocal gouty disease is observed in this country than anywhere else in the world.

"I believe that there is a basic arthritic habit of body or diathesis, and that from this issue at least two branches,—the gouty and rheumatic. These two are not convertible,—cannot produce each other,—but they commingle. In regard to the teeth, the primary dentition is usually satisfactory, and not different from that of

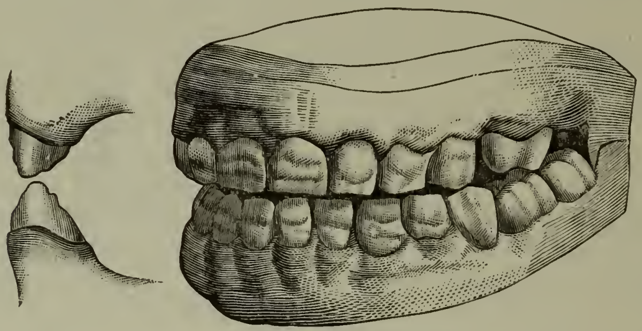
healthy children. My experience is different from Dr. Alfred Carpenter, in that the teeth of gouty patients are not subject to caries. Amongst three hundred hospital patients who were the subjects of inherited gout in varying degree, I found the teeth were remarkably strong, well enameled, and free from decay. Laycock taught this twenty-five years ago, as has his pupil, Mr. Jonathan Hutchinson, and also Mr. Colsen. I find the teeth unusually large and regular in the arthritic diathesis; the edges smooth in the permanent set, not crenated. There is a tendency for one or more of the incisors in the lawer jaw to be pushed forward, which Laycock called 'buck teeth,' but I do not think this is confined to this particular habit, as any teeth are apt to rotate in their sockets in later life and protrude. Children of this diathesis are apt to grind their teeth during sleep, and persist in the habit to adult life, when it is done with such force as to chip and break the enamel. The enamel is usually yellow—white teeth being uncommon—and the color will deepen in time. They are vigorous and firmly planted, and extraction is difficult. The texture of the dental tissues is abnormally hard, yet the teeth are apt to wear down on the articulating faces. There is a disposition to tartar, which often collects in large quantities. Perfectly sound teeth are apt to be shed as age advances, as illustrated in several instances. Indeed, one case, a man of twenty-six, became prematurely edentulous, as did others. Mingled with other diatheses,—syphilitic, scrofulous, tuberculous, rheumatic, etc.,—the gouty habit presents corresponding peculiar phases. In America unequivocal gout is rarely seen, and then is usually mixed with the rheumatic diathesis, as this disease is endemic there."

Dr. Alfred Carpenter says, "The effects of the gouty diathesis do not show themselves so markedly upon the teeth in early life, as is the case with the syphilitic and tubercular states. It manifests itself in another way, and other tissues suffer more than the teeth, though caries is not uncommon. It is a disease of later life, so that the progeny of gouty persons are usually born before the humors have been affected in the parent. The constitution is not thoroughly gouty before forty, and men do not have many children after forty. So the children inheriting a gouty diathesis are rare. Still, I think it is a fact that the teeth of such do decay early. This disease has its origin in fatty degeneration of the dental cells, and the subjects of it are especially liable to those peridental inflammations which ultimately lead to necrosis. Gouty persons also suffer from neuralgias and other conditions which have their origin in a lithic acid diathesis, which is often accompanied by pain, which reflects itself upon every function of the body."

Dr. W. Stewart took casts of the teeth of eleven gouty patients. In all the teeth were thick and solid and worn below the edges.

Mr. Fothergill said "these teeth had been first described by Dr. Laycock, of Edinburgh. In these casts the teeth presented a resemblance to those descriptions that was unmistakable. They were all solid teeth. The wearing down was probably due to the presence of uric acid in the saliva." Mr. Sewill thought that "while the teeth were not pathognomonic, they were sufficiently pronounced to form an aid in diagnosis."

Dr. Horatio Dorkin writes that "Dr. Graves, in 1836, described the connection between grinding teeth in the sleep and the gouty diathesis, and explained it as being due to an irritable condition of the dental nerves. I know of eight children, the whole family, whose father has frequent attacks of gout, acute and seemingly acquired, and the mother's mother and grandfather suffered from the same disease. These children grind their teeth incessantly at night, and have done so all their lives. They all cut their teeth



at an early age, having had generally two and some four teeth at three months. In several of the children the teeth are worn. Some of them are also somnambulists and sleep-walkers. Most of them are nervous, and suffer from epistaxis. The two eldest have corneal ulcers. The teeth of all are characteristic."

In view, therefore, of the interesting scientific history given to this disease, especially in regard to its effects in producing teeth which are truly pathognomonic, it was with considerable interest that the writer discovered a case of gout in this country which is genuinely characteristic, and which has an authentic history. The patient is a woman of thirty or more now, of arthritic diathesis, and anemic from gout and rheumatism. The family is English, of course, for the case is imported and is not an indigenous product. Gout has been in both branches of the family for several generations, and the children inherit it directly. They have suffered from it from infancy, as this patient does yet.

Casts of the teeth of the case are herewith submitted, and it is

noticed that the characteristics are pronounced. The teeth are short, thick in all directions, with heavy shoulders upon the lingual sides, and all very dark, solid, square, dense, and hard. The markings consist of transverse or encircling grooves or terraces, which give the teeth a step-like appearance. These grooves are perhaps characteristic, and are not to be confused with various kinds of grooves which mark the teeth affected by retarded development from different causes. The gums are light and thin, and present thin margins against the crown.

But it is only the anterior teeth that are attacked, and the bicuspids are but slightly marked. The first molars were presumably affected, but some of them are now absent. The other molars are normal and present no peculiarities of shape, but the history of an extraction as given by the patient leaves little doubt but that the teeth possess all the other characteristics, especially the difficulty of extracting, which is a regular accompaniment of the diathesis.

Very recently Mr. Milner Fothergill says, "There is little doubt but that the configuration of the teeth in gout has a distinct value. The teeth are solid, and in the 'Norse' type—massive. They are blunt and thick at the edges and worn down. They have a great tendency to come out without any caries, but from osteitis extending from the neck along the fang. The incisors are more worn down than the cuspids or molars are. The center of the tooth is more of a dark color. When a gouty person shows the teeth they are at once to be detected. The gum is much retracted. Sometimes the upper front teeth are very massive." This description can well be applied to the cast before us of gouty teeth in all characteristics,—early wearing of the edges, the retracted gum, etc.

PYORRHEA ALVEOLARIS.

BY EUGENE S. TALBOT, M.D., D.D.S., CHICAGO, ILL.

The lesion indicated by the title of this paper and known under various other designations is more common and more destructive than any other affection of the teeth except dental caries. It is safe to say that a very large majority of persons over twenty-five years of age are to a greater or less extent affected by it. It is only since a comparatively recent date that the disease has been described and efforts made to determine its pathology and treatment. A considerable variety of theories have been advanced as to its etiology. Drs. Riggs and Mills favor the salivary calculus theory. Dr. Rehwinkel—who, by the way, suggested the term "pyorrhea alveolaris," in a paper read before the American Dental Association in 1877—taught that

constitutional and hereditary causes were concerned in the production of the disease. Dr. C. G. Davis believes that an explanation is to be found in low vitality and feeble vascularity. Dr. Rawls holds the opinion that a mercurial taint and the effects of chloride of sodium account for this pathological expression, likening it to scurvy produced by a salt-meat diet. Dr. L. C. Ingersoll believes sanguinary calculus to be the origin of the trouble, and claims that it is impossible for salivary calculus to be deposited at the apices of the roots, but that the calcium salts which are in solution in the blood are carried directly through the capillaries and deposited upon the roots of the teeth. Drs. Witzel, Arkövy, Black, and others believe pyorrhea to be a specific infectious disease, from the fact that the seat of the lesion and the exudate are filled with living micro-organisms. Dr. J. D. Patterson expresses the opinion that it is a catarrhal condition, and supports the theory because of the correspondence of the symptoms with those of catarrh, and gives a record of twenty-four cases in which catarrh of the nasal passages, or of the pharynx or larynx, —generally combined,—coexisted with pyorrhea alveolaris.

We should be able to get some light upon the subject by a careful study of the anatomy and physiology of the parts involved. The alveolar processes forming the alveoli are rich in blood-vessels. The periosteum is a thick, fibrous, vascular tissue lining the alveoli and continuous with the periosteum, covering the maxillary bones and receiving its nourishment through the alveolar process. The peridental membrane covering the cementum of the teeth and extending from their foramina to their necks is finer in texture and more feeble in blood supply than the periosteum. It receives its nerve and blood-supply partly from the nerves and blood-vessels at the apical foramen and partly from the submucous tissue of the mucous membrane, which is continuous through the nares, fauces, and the cavity of the mouth, and extends to the necks of the teeth. The mucous membrane is composed of two layers—the submucous layer or true membrane and the epithelium or false membrane. It is the submucous layer which comes in contact with the periosteum, and bears the same relation to that tissue as the peridental membrane does to the periosteum in the alveolus. This part of the mucous membrane is continuous with and sends blood and nerve supply into the peridental membrane. The epithelial or outer layer of the mucous membrane extends only as far as the necks of the teeth. It will be observed that the same periosteum which covers the bones of the face lines the alveoli; that the fibro-vascular layer of the mucous membrane covers the periosteum, is continuous with and becomes the peridental membrane. Understanding this intimate anatomical and physiological relation, it is easy to accept Dr. Patterson's statement

—that in the early stages pyorrhea alveolaris bears a striking similarity in its pathology and symptoms to catarrh.

Mucous membrane is a delicate structure as compared with skin and periosteum. Its vascularity and abundant nervous supply render it liable to inflammation from apparently trivial causes, while the richness of anastomosis explains the rapidity with which an inflammation of this structure spreads.

Another explanation of its susceptibility to inflammatory action is to be found in the mucous follicles which are so plentifully scattered over the surface, having for their office the secretion of mucus. It is at the point where its fibro-vascular layer blends with the peridental membrane that inflammatory action produces special mischief, because of the fact that neither the alveolar walls nor the tooth-structure are yielding, and the pressure of the accumulating products of inflammation causes strangulation of the parts from which the peridental membrane obtains its blood supply. As a result, we have innutrition and consequent sloughing of the peridental membrane, and an attempt at elimination of the dead tissue by suppuration. "Catarrh," according to Quain, "is inflammation of the mucous membrane attended with increased secretion." So if any local or constitutional cause produces an inflammation of the mucous membrane, it is liable to extend as far as the necks of the teeth, and involves the peridental membrane, thus producing the symptoms of catarrh. The disease may and frequently does exist in an incipient stage without any accumulation of pus about the necks of the teeth, but when the gums become thickened and bleed freely nourishment is cut off, and the peridental membrane and alveolar process undergo change. If stimulation of the gums is kept up by the tooth-brush, favoring absorption of the gums and alveolar process, the inflammatory products are carried away without the appearance of pus. But if the gums and alveolar process are not stimulated and absorption does not take place, the peridental membrane, not being permitted to expand, sloughs away, and pockets containing pus will be found about the roots of the teeth.

We may consider, then, as predisposing and exciting causes a perverted condition of the secretions, low vitality, sanguinary calculus, and all diseases which affect the circulation, and as among the local causes catarrh, fistulæ, salivary calculus, irritation from foreign substances, such as detached bristles from the tooth-brush, too great friction in brushing, injudicious use of the tooth-pick, the use of ligatures and regulating apparatus, application of the rubber dam and clamps, artificial dentures and regulating plates, accumulation and decomposition of food under artificial dentures and at the necks of the teeth, drugs which over-stimulate the parts, the use of tobacco, fillings ex-

tending beyond the cervical margins, digestive derangements, contagion from unclean instruments, and improper mouth-washes and tooth-powders, especially charcoal. In a word, whatever irritates the peridental membrane is likely to produce the lesion under consideration. The devitalization of pulps and the filling of roots, which throws increased work upon this membrane, are also to be accounted as among the factors responsible for this pathological condition.

We cannot expect the operator to discard dams, clamps, ligatures, regulating apparatus, etc., but the liability alluded to should be borne in mind.

I am convinced that the disease is contagious, and if one affected tooth is allowed to remain in the mouth all the rest of the teeth are endangered.

The treatment indicated includes a systematic and thorough cleansing of the mouth to remove food débris and salivary deposits, with only enough friction from the brush, however, to produce healthy action. In the early stages of the disease, a mildly astringent mouth-wash may be of advantage. If the alveolar process has been absorbed, exposing the apex of the root, the tooth should be removed. If a tooth have two or three roots, and one or two of them be dead, the dead ones should be cut off. If pus has collected around the teeth, the alveolar border should be gently scraped to remove all rough edges, and so favor new granulations as well as bring the alveolar border on a level with the peridental membrane, so that the inflammatory products may be readily thrown off. But this operation should be very carefully performed to avoid injury of the periosteum. If the teeth, especially the anterior ones, have become loose, while the alveolar process and membrane remain intact for one-half the length of the root, the teeth should be ligatured to prevent vibration and irritation.

The instruments for removing the alveolar edge in the treatment of pyorrhea should be specially adapted for that purpose, with rounded shanks and bent at suitable angles. The set which bears Dr. Allport's name is, in my estimation, the best I have seen. After trimming the alveolar border, the parts should be syringed with tepid water, and subsequently with stimulating and astringent washes.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION.

(Continued from page 618.)

SECOND DAY—*Evening Session.*

The association was called to order by President Barrett at 8.15 P.M. The consideration of Section IV was resumed.

Dr. Marshall stated that Dr. Fernandez had placed in his hands for exhibition to the members of the association a tool for dressing corundum wheels and points. It is made of black diamond set in soft steel. A hole is drilled in the end of the piece of steel, the diamond inserted and the steel closed down on it. With this appliance one can shape wheels and points as desired.

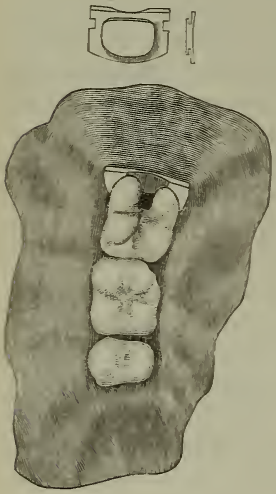
Dr. Brophy did not intend to speak of his matrix, but as it has been suggested by the chairman of the Section he had no hesitation in doing so, especially as some may not have seen the appliance or know the merits he claims for it. A wedge not only injures the tissues, but it prevents the proper adjustment of the gold around the edges of the cavity. He had experimented with thin bands of steel for matrices, and found that they worked satisfactorily if only a practicable means for securing them in place could be devised. After considerable trouble the idea of a screw passing through the band, pressing against the tooth and drawing the band to it, occurred to him, and he had found it just what was wanted. This appliance may be adjusted to the neck of the tooth, and yet remain pliable enough to let the operator carry the gold around the edges perfectly. By carrying the gold between the tooth-wall and the band it is more likely to be perfectly adapted than when the matrix is not used. He thought this form superior to the old-fashioned forms which were held in place by wedges. Dr. Herbst's matrix is open to the objection that it is made to pass over the crown, and it is thus not necessary to adapt it close to the neck. The use of a matrix enables, almost forces, us to get better fillings than without it, because there is a better opportunity to carry up the gold square. The filling can be finished without displacing the matrix. One advantage is that it can be used on any of the teeth, while the old-fashioned matrix could not be used on the posterior teeth except with complicated apparatus to hold it in place. The band matrix will pass where floss silk will not, and it can be tightened with a watch-key or a little lever. In adjusting it the screw should be placed on the lingual wall of the lower teeth and on the buccal wall of the upper ones.*

Dr. Perry described his attachment for the dental engine by which he was enabled to combine the advantages of the Elliott suspension and Bonwill engines. It is a device by means of which the power is applied by running the cord directly over a set of pulleys attached to a block which swivels around the end of the hand-piece. The result is a steady, lathe-like motion, with absolute freedom of

* A full description, with illustrations, of the band matrix will be found in the Dental Cosmos for May, 1886, p. 287.

movement except in one position—when the hand-piece and arm are in line; but this is easily remedied by raising or lowering the extension arm.

Dr. S. C. G. Watkins showed his instruments for finishing amalgam or other plastic fillings at the approximal or cervical surfaces. No doubt all of you have seen such fillings which projected along the cervical walls. Seeing so many of these, had stirred him up to making these instruments. There are six instruments on three handles. With them it seems just as easy to trim off the cervical edges of approximal fillings, even when the fillings extend beyond the gum-margins, as any other portions. The instruments are so curved that in drawing them in one way they will cut, and the other way they scrape; and so thin that any obstruction will spring them off. He also showed a tooth-brush which he had devised. It is curved all the way, and narrow, with a swell at the point. With this brush every portion of the teeth is readily got at, including the posterior surfaces of the wisdom-teeth and the lingual surfaces of the incisors.



Dr. Guilford had been a believer in and user of matrices for many years. One difficulty in the matrices already in the market is that there is none for use in compound cavities in the last tooth in the mouth, except the band matrix, the objection to which is the difficulty of getting it between the teeth. He had endeavored to devise a band matrix which would not occupy more than one interdental space, and be held in place by a clamp which would not obstruct the view of the cavity. [Dr. Guilford here showed by sketches on the blackboard the ideas embraced in his matrix and clamp. A full description will be found in the DENTAL COSMOS for March, 1886, page 138.] A fact not alluded to by Dr. Brophy, but of considerable importance, is that the force used in impacting the gold causes the band matrix to give a little, which is a decided advantage, inasmuch as it enables one to be sure of his margins and gives a chance to dress off the surplus gold. In addition to the ordinary uses of matrices, they come in very handily in filling small cavities on the approximal sides of bicuspids, or even of molars, where they do not reach to the masticating surface of the tooth.

Dr. Swasey's method of retaining matrices in position alluded to in the report of the Section was not described before the association,

but a brief description with illustrations is inserted here. It is intended for use in posterior approximal cavities where the tooth behind the one to be operated on is only partially erupted, making it very difficult to get the dam in place and hold it there. Dr. Swasey's method is to put a drop of soft solder on the back of a Jack matrix, and form it into a button (see cut). A hole is then punched in the rubber dam, the button passed through it, and another hole for the tooth with the cavity to be filled is punched just at the lower edge of the matrix; holes for any other teeth to be cut where desired. The face of the button is fitted to rest against the posterior tooth. When the matrix is forced down between the teeth it will carry the dam just where it is wanted, and the face of the matrix will be held firmly against the face of the tooth to be filled, and will rest against the posterior tooth, giving a solid and steady support to the matrix.

The Section was passed.

Section V, Anatomy, Histology, and Microscopy, was called, and Dr. Frank Abbott, chairman, read the report, which stated that while work of great importance in the microscopical world is being pushed forward, very little has been made public. Nothing of importance either in Anatomy or Histology, pure and simple, has come to the notice of the Section. One paper was reported, entitled "Hyperostosis of Roots of Teeth," by Dr. Frank Abbott, of New York.

Dr. Abbott then read his paper, which will be found at page 665, current issue of the DENTAL COSMOS.

Adjourned till 9 A. M., Thursday morning.

THIRD DAY.—*Morning Session.*

After the transaction of routine business, a supplemental report of Section I, relating to the appliances presented by Dr. J. Rollo Knapp, was presented and discussed.*

Dr. Peirce reported from the Committee on Voluntary Papers, that a paper had been received which in the judgment of the committee was too long to be read in full, but as it contained some valuable information, they asked to have it referred to the Publication Committee. The report was adopted.

A resolution was adopted requesting all members and visitors to register their names with the executive committee.

The consideration of Section V was then resumed, and Dr. Abbott's paper was declared open for discussion.

Dr. W. H. Atkinson. This is a question that ought to command our

* See DENTAL COSMOS, September, 1886, p. 564.

earnest attention, for it lies at the foundation of all the clean work that can be done by our members. It is, as it were, but in its infancy. When the old solidal pathology held sway, nothing was known without examining how solid bodies moved, and when it was sure that the blood and mucus and lymph had something to do with the well-being of animal bodies, the fluidal or humoral pathology came into existence, and in the investigations as to how function was performed, in view of the operations of solids and fluids, it was undertaken to find the locality in which these actions did take place, and Schwann and his confrères brought in the cellular pathology, after having observed first the then condition of the conversion of protoplasm into the structure of bodies in the vegetable kingdom. Cellular pathology held sway for a short period, and is not as yet entirely given up. *Now* the pragmatic pathology has come in, by our seeing that all that is operated in functional bodies is the effect of some unseen element that works the changes inside and outside of the so-called cells; and the paper that was read last night and the drawings that were presented are stepping stones, to show as far as possible the ultimate elements in the elemental bodies in which these changes take place that are called nutritional, and what would be of the greatest advantage to us is, to throw away all irrelevant matter and go directly at the work, to see if we can comprehend how it is that these changes do take place, so that they can be seen and diagnosed, as so beautifully displayed in this hyperostosis, as it is called. By the aid of the microscope, we are trying to get at the work that has already been effected, that only reveals the plan and mode of the arrest of the radiance, by which I mean light and plus, which means energy that has converted all these foods into protoplasm, so as to take from an almost homogeneous substance, which is the storehouse of the radiancy, that in its different degrees of embodiment shall constitute bodies that we can see. What is the first body that we can see? It is a granule. No man can see a molecule. No amplification of power of any microscope that has yet been discovered has been able to get at it. I call it an ideal body, and the statements are made merely as crutches to help our minds to grasp the perception of what afterwards becomes competent to be perceived by our senses. These drawings are the valuable part of it. If I had the time and willingness and you the patience to go over the paper and show what is worthy of attention, and what is doctrine and what is fuss and feathers and flummery and false deduction, I might bless you and be blessed. The time has gone by when domination can hold sway any longer on earth among men. We do not say "Be damned" any more; we say, "Let us see." These papers are, as Prof. Abbott has justly

said, the culmination of drawings. I don't know but there are surprises for us,—that some young man may not transcend all this the next time we come together, and set men into a dynamite explosion. I will try to say something that will at least find lodgment in your minds enough to inspire you with a desire to know, so that you may make investigations. As to the doctrine. The doctrine that was pronounced as settled is not settled at all. It is a mere hypothesis and an assumption, and that is what has ailed us all the way through; that we assumed a knowledge we did not have, and set forth as ex-cathedra, and required men to subscribe to it or be put out of the synagogue. "The Lord is in His holy temple; let all the people keep silence before Him," was said of the Elohim of the Hebrews long ago. Since that we have ceased to follow immediate leaders, and we have had our leaders back in the same class with only one single term ahead. The assumption that hyperostosis occurs in utero and during the development of the teeth with living pulps is an assumption, and not proved. I do not think it ever will be proved. There are too many circumstances that indicate to us that this deflection of the store of radiancy was not potentially resident in the tooth-germ, so that by possibility all the nutriment or new impact of energy that would stop the deflection would get increased deposits of, first, protoplasm, and then embryonal corpuscles, and then the cementoblasts, and then deposit the lime-salts, to make it hard enough to hold it, so that it could be cut and made visible in the section we have. The very fact of roots of teeth having ten to twelve or fifteen distinct laminæ of cement-corpuscles laid on them, and obliterating all the intervening spaces that were once traversing the alveoli, and fusing with the adjoining tooth, as I have seen five teeth right along, all extracted in one solid phalanx, —to say that they could have occurred before the teeth were erupted is contradicted by the line upon which we find them standing. If I have had a glimpse of the law, it is want of use that raises the mischief among us always, of rheumatism, gout, tumor, cancer. It is the lack of the togetherness of use that induces the impact. Energy is expended upon the function of the tooth in occluding against the other one, and does not order the deposit of the lime-salts that are in the neighborhood, so as to encroach upon the socket and at last unite with the other tooth adjoining it. You will find that the so-called peridental membrane leads us a great way into trouble. Every membrane has a basis of connective-tissue corpuscles as its stratification or foundation-stone, and when they tell me that you must save the periosteum if you expect to get reproduction of bone, they are in fault. It is not the periosteum that is the bone-producer; it is the substratum of osteoblasts that lie immediately be-

tween the periosteum and the formed bone to which we must look as the immediate antecedent of the production of the bone or the cementum. We need in our intellectual growth to do as we do in our bodily growth. We need to take the breath in, steal out of it that which we need, and expel and not take in that breath again. We never do take any of these steps twice. We cannot by any possibility do it mentally or bodily, but to carry us to the point where we get the conception of how the so-called forces are differentiated into the bringing-up of the five tissues constituting the body, and how they are maintained during the lifetime of the possessor of the tissues, is what we desire to get at. I have tried to follow the line in my own mind, but as I say it was a miscalculation to make a deduction, and it ought not to be presented in a paper where there are men who are less endowed with the understanding of the subject than the man who reads the paper and makes the investigation; whether he reads it originally as his production or that of somebody else does not matter so much; but if you knew how my protoplasm boils when I see men using other men's ideas and not being quite full in their apprehension and acknowledgment, you know if I *could* fight, that is when I *would* fight; but it is not contention that we need but emulation,—who shall do the work best. Then I would not have so much of this brush in the way to cut, before I could get at the point that would enable you to get the conception of these tissues, that comes from an endowment which is entirely beyond the range of sense. No man knows why. I do not know the why of anything. We ask how it is. That is what the microscope can reveal, but when does it reveal it? After the work is done. After the man is dead they will cut him up and tell what ailed him. They don't know what ailed him. They have simply the tracks that the ghost left, and they describe that as disease. These are provisions of this little embodiment of energy to maintain their possession as long as possible, as each one of us tries to maintain his possession as long as possible, and however retiring and sylph-like he may be, you put him far enough to the corner, and he will fight like a cat for his individuality. These fellows are doing this very thing by building so much of this pericementum here as to make a mass that was called oxostosis. We say arsenic caused the mischief, when it was the energy that lay behind the arsenic that caused the mischief, and the arsenic was the vehicle. Arsenic is a metal, has no affinity for any of the tissues, and it must be oxidized or have some agent in contact with it that changes it from a metal to a salt, and then, when that molecule is broken up by reason of the pabulum in the tissue having a greater affinity for the oxygen (that is made oxide of

arsenic) than the arsenic has for it, an unmarrying and disruption of the molecules take place, and that is where the poisoning comes in. All the salts hold the same law. All the ashes hold the same law. Ashes are the product of burnt metals. This is the divine word of truth and soberness, if you will only allow your minds to be so set upon it until you can catch the stored radiancy and store it to be useful to you afterwards. The law of nutrition begins upon the same principles. It has the type behind it. That type is the mode of storing radiance, and that gives us variety of the inhabitants of the planets, and that is the point they have been dealing with. We know the Darwinians and the evolutionists have been trying to find out how they could distinguish between species and variety and genus; that it was this inherited past molecular experience of ancestral activities that had been stored in the protoplasm, from which the new germ was produced, from which the body, teeth and all, comes out by the expression of the re-awakened energies.

Dr. A. H. Thompson. Dr. Abbott has again placed us under obligations to him for one of his classical productions, which we shall be better able to comprehend by leisurely study after its publication.

It has occurred to me that there might be such a thing as a *nodular diathesis*, or idiosyncrasy, in which nodular growths are produced on other bones of the body, as well as upon the teeth. We know there are growths on other bones, and it would be interesting to observe by post-mortem examination when exostoses occur on the teeth, if they are accompanied by growths on the other bones in the same individual.

Dr. Atkinson. I offer a Delmonico dinner and a pair of clean sheets at my own house, and a week's lodging, for a specimen of hyperostosis, or so-called pericementosis, upon a tooth that has never lost its occlusion. Thumb-suckers and mouth-breathers are the people who have these troubles.

Dr. Ingersoll. I wish to speak in the highest commendation of the paper, as being in the right direction of investigation in fields that are not well known to us. Progress is what we desire. There are two or three points only which I shall refer to. That first introduced in the paper had reference to inflammation of dentine. There are many of us here who remember that sort of phraseology twenty-five years ago. It was then said that we could not properly speak of inflammation of dentine, and a compromise was made, and the term *sensitive dentine* was adopted. Do the terms inflamed dentine and sensitive dentine mean the same thing? That which I understand as sensitive dentine is emphatically inflamed dentine;

and there is such a thing as inflammation of the hard tissues, not excepting the dentine. The objection raised to that statement of the case is this: Inflammation implies vascular action. Is there any vascular action in dentine? I have been in the habit of viewing the subject in this manner: It is not necessary that a tissue manifest every process of inflammation before it may be said to be inflamed. We may have some manifestations of inflammation in one tissue which do not appear in another. All are not equally vascular. We know that there is such a thing as inflammation of cartilage, yet that is not a vascular tissue. It borrows its vascular supply from the surrounding tissues, and its pathological conditions also. It has been suggested that the blood-corpuscles cannot enter the tubules of the dentine, and therefore there can be no such thing as inflammation of the dentine; but the entrance of blood-corpuscles is not necessary to inflammation. Is there a circulation in the dentine? That is the question. We must all say yes; there is nutrition, therefore there must be circulation, and an activity in promoting it, allied to vascular action. Now, concerning sensation. The dentine is not *peculiarly* sensitive,—that is, it is not in a pathological condition until it becomes inflamed; nor is the pulp itself. I see no impropriety, therefore, in speaking of inflamed dentine. In dental science we have discovered that neither in structure nor in chemical constituents is tooth-substance *bone.* There is no anatomist to-day that recognizes cementum even as perfectly identical with bone. Hence we call it *cementum.* The phraseology which Dr. Abbott used last night was hyperostosis. Why not call it excementosis, dropping the syllable *os* as pertaining distinctly to bone-structure? Then we shall have a nomenclature of our own in harmony with dental science, and which would distinguish an excessive deposit of calcareous matter upon cementum from a calcareous deposit upon normal bone. One word with reference to the nature of this deposit. Is it proper to speak of it as hypertrophy? Has it the characteristics of hypertrophy, or of tumefaction, which? I look upon it rather as a tumefaction than a hypertrophy. We may have such a thing as hypertrophy of the cementum, but it is physiological and not pathological. Physiological hypertrophy is the result of excessive *excitation.* Excementosis is pathological and results from *irritation.* All the functions of the body are set into operation by normal *excitants*, but not by *irritants*, and yet a normal excitant may become an irritant by being excessive.

All teeth do not have the same thickness of cementum. There is a great variation in that respect, depending upon the degree of normal excitation of the organs. Teeth that are used thoroughly in mastication will very likely be found to have thicker cementum upon

their roots than teeth that are not thus used. Such teeth may have physiological hypertrophy, not pathological excementosis. One is a healthy condition and the other unhealthy. If we accept the theory of inflammatory action in dentine, it furnishes to my mind another factor in the process of dental decay. The processes of nutrition are similar throughout the entire body. So are the processes of inflammation and of destruction.

The dentine and the bone are constructed on very much the same plan, the only difference being that one is a tubular structure and the other a cancellated structure. If we study inflammation in the bone, we will find that the medullary portion is that part in which are developed the active processes of inflammation. The expansion of the tissue under inflammation takes place at the expense of the walls of the cancelli; thus we have the *softening process* of bone. We may have precisely the same thing in the dentine; namely, the expansion of the dental fibrils at the expense of the intervening hard tissue, resulting in what we call demineralization. So that we do not get an explanation of the *whole* of the process of decay through either the germ theory or the acid theory. We need the inflammatory theory before we have the whole, operating, as I have observed, in the demineralization of dentine.

Dr. Welch. I understood Dr. Atkinson to say he never knew of a case of hypertrophy of the cementum of a tooth where it had natural proper occlusion.

Dr. Atkinson. You understood me correctly.

Dr. Welch. He offered so many good things to one who would show him a case, that I do not think I can miss them. I had a tooth extracted myself that had a proper and natural occlusion, and was hypertrophied. Dr. Fuller extracted it for me, and I think will testify to the same.

Dr. Atkinson. The most profitable thing I can say to you is this, that we have two modifications of physiological action; one is called hyperintrusion and the other is called marasmus. It is the antegrade or retrograde movement of the currents of nutrient activity that produces these results. We see in the one case it produces the example before us; in the other case where the irritation so-called has taken the reverse current; the cement and the interzonal layer of corpuscles have been taken off the dentine, leaving pointed roots of teeth in aged persons.

Dr. Morgan. I regard the paper read last evening as one of very great value, and the drawings exhibited the most beautiful I have ever seen. Most of what was stated in the paper, as far as I understood it, I accept, but there were some inferences drawn that I think are incorrect. I shall allude to but a single one of them. The

statement was made that this hypertrophied condition or increase of cementum upon the roots of teeth never occurs after the destruction of the pulp. I take issue with the writer upon that subject. The investing membrane of the tooth continues to be a functioning organ after the destruction of the pulp, and, as this hypertrophy or increase of cementum is necessarily the result of the functioning of that membrane, it may occur at any time while that membrane is in a living condition. The membrane being entirely independent of the pulp of the tooth, having no direct connection with it, I cannot see how any of its functions would be destroyed by the destruction of the pulp. My friend, Dr. Ingersoll, made a very clear, concise talk, and opened up to my mind some avenues of thought that had not previously occurred to me, and yet he assumed some points upon which I must differ with him. For instance, he claimed that all sensitive dentine is in an inflamed condition. I take it that the teeth are somewhat analogous to other structures of the body, in their manner of function and sustenance. We have in general surgery what is called healing by first intention, a process in which it is now claimed there is no true inflammation. But there is a great increase of sensibility at that point, and it is contended that it is the result of irritation only, and not of true inflammation. I hold that the same may be possible in the teeth. There is an effort in nature toward repair when by attrition the tooth is worn down, in which the tubuli are filled in with lime-salts and the tooth becomes eburnified. May we not have in the teeth exactly a corresponding condition to that which occurs in healing by first intention, and may not the increase of circulation in that case explain the increase of sensible pain in the softer parts. That there is inflammation in dentine, I do not for a moment question, and I think Mr. Tomes's observation, demonstrating the enlargement of the dentinal tubuli, would settle that question if there was no other proof.

Dr. Ingersoll. May I correct a mistake which Dr. Morgan has made? You remember I put in one word which the doctor left out; I said any *peculiar* sensation. There is sensation of the dentine, but not a painful sensation; it is simply the normal physiological sensation. When that *peculiar* sensibility exists and gives the twinge of pain, *that* is the evidence of inflammatory action. With regard to the illustration which he gave of healing by first intention, in which there is no inflammation, I think we have all been utterly confused in reading different authors with regard to the use of the term inflammation. Stricker, in the "International Surgery," uses the word inflammation as having reference almost exclusively to the suppurative stage, and you might well imagine that he did not mean anything else but suppuration whenever he spoke of inflammation.

Another man means nothing but hyperemia. Another refers to some other feature of it, and uses the term uniformly in that relation. Stricker divides all the processes of inflammation into hyperemia and metamorphosis of tissue. He says, in effect, in hyperemia I mean to include all the manifestations that attend it, and in metamorphosis I mean to include everything I did not include in hyperemia. I do not believe that we understand inflammation by any such limited phraseology. We must include the whole by separate phrases. Irritation is as much inflammation as suppuration, because it is one of the processes. Inflammation is not a simple condition, but a series of progressive and changing processes, going on from irritation to death; and one is just as much inflammation as the other, only we define each stage by a different term,—thus we have irritation, hyperemia, congestion, induration, suppuration, etc., each designating a particular stage in the progress of inflammation. Before there can be a lesion anywhere there must first be irritation, or an *injury*, as the English call it. That is the first stage in the inflammatory processes, or is one of the stages of inflammation. When the surgeon says there is no inflammation in a wound healing by first intention, he means that there is no suppuration, or none of the usual manifestations that follow an injury.

Healing by first intention is healing without loss of tissue. Healing by second intention is healing with loss of tissue and the reorganization of new tissue, the cicatricial tissue, to restore the loss.

Dr. Abbott. Absolute knowledge in reference to the beginning of the formation of tumors upon the roots of teeth has not been attained, nor do I suppose it ever will be to a certainty. It is simply an opinion of mine—I do not state it as a settled fact—that they cannot develop unless the functions of all the tissues of such teeth are in working order. In other words, if the pulp be dead in a tooth, the function of the pericementum is thereby interfered with or modified to such an extent that the growth cannot occur. Whether it can or cannot occur upon teeth where there are antagonizing teeth is another question of more or less importance. One gentleman states that he had a tooth extracted from his own mouth with an enlarged root with its antagonist intact. I have always taken the affirmative side of this question, and if I am right in my conclusions in the paper—*and this case is evidence in my favor*—that the origin is at the beginning of the formation of the cementum, then it can make no difference whether the affected tooth has an antagonist or not. Prof. Taft kindly says to me that he has a case in hand where the antagonism was perfect and there were great nodules upon the roots of a tooth taken out. Dr. Atkinson evidently owes these gentlemen something.

Dr. Atkinson. If they prove their statements.

Dr. Abbott. I stated in my paper that one of the conditions which induced this growth was where the antagonizing tooth in the lower jaw had been taken out, and that gravitation of the upper tooth tended to irritate the periosteum to such an extent that a growth might occur if there was a systemic condition which favored the growth of such tumors. As far as this work is concerned, I wish that any of the gentlemen who have a curiosity to know anything about the labor connected with an investigation of this kind would endeavor to do something like it. The work of preparing specimens for microscopical study is not inconsiderable, I can assure you, to say nothing of the preparation of the paper.

A careful study of these sections will, I think, convince any, except those who "*know it all*," that the disease in those teeth at least commenced in an original malformation of the tissue of the cementum. Another point that should be clearly understood in reference to the growth of cement upon the roots of teeth is that no one knows when it begins nor when it ends. Whether its growth is simultaneous with the growth of the root, after the formation of the crown, or whether it follows immediately after, has never been decided, and it can only be decided by careful, earnest, and honest investigation by some person who has enthusiasm enough to go into the work and follow it up until all the facts are ascertained and established beyond a doubt.

The subject of inflammation of dentine or inflammation of any tissue is so large, and I have already said so much about it in one way or another, that I will leave the matter where it now stands, hoping that I have done something that will induce others to go further. If I have made a statement that any one does not believe, all I can say is, investigate for yourselves; discover my mistakes, if you can. They are undoubtedly many, and may be easy to find. Unlike some whom I might mention, I have fortunately not yet reached a state of *infallibility*.

Section V was passed.

(To be continued.)

SOUTHERN DENTAL ASSOCIATION.

(Continued from page 625.)

SECOND DAY.—*Afternoon Session.*

THE association was called to order at 3.30, and the regular order of business was resumed.

The Committees on Pathology and Therapeutics, Histology and Microscopy, and Chemistry were successively called and passed, no one responding.

The Committee on Operative Dentistry being then called, Dr. William Crenshaw, Atlanta, Ga., read a paper entitled "A Complete System Possible in Filling Teeth;" and Dr. O. A. Salomon read an essay on "Nerve Canals," by Dr. James S. Knapp, New Orleans, La., who was not able to be present by reason of sickness in his family.

The following is a synopsis of Dr. Crenshaw's paper:

A retrospective view of the principles and plans for filling teeth, in the light of present possibilities, constitutes a glimpse of what I may almost call the dark ages of dentistry. I cannot imagine in any earlier stage of our art a state of affairs more antagonistic, if not ruinous, to the natural forms, requirements, and well-being of the teeth than the methods upon which teeth have been filled up to a very modern date. Five years ago, when I was about to give up a work the methods of which seemed so poorly adequate to the necessities of the times, the beneficent light of the immortal Webb and his co-laborers and confrères fell upon my pathway, and I saw for the first time the possibility of a complete system in the filling of teeth. The principles then declared by our Northeastern brethren were to the effect that the highest excellence, the greatest and most permanent good, in the treatment of approximal surfaces can be attained only in that practice which restores the anatomical features of the tooth, and which, when the anatomical development is below an ideal form, changes it by judicious trimming and cutting so as to bring about the ideal. As the phrase may be considered somewhat arbitrary, I would define "ideal form" as representing crowns of good conformation,—that is, with the approximal, labial, and lingual surfaces of molars and bicuspids with natural curves, so that the teeth touch with somewhat the appearance of two eggs placed together, though not nearly so pronounced in effect: showing a well-defined V-shaped space at the gum in the upper and an A-shaped space at the gum in the lower.

I take it, then, for granted that in the restoration of this anatomical feature of a tooth—touching its fellows on either side in as nearly as possible a natural way—we have a state of the art which challenges admiration and imagination, because in this we have nature's arrangement reproduced. In contradistinction to the flat-surface plan, we have, in a pair of bicuspids for example, the rounded and contoured approximal surfaces restored in natural curved lines, touching only at one point. This secures not only exemption from decay, but, with proper attention given them in cleansing, I maintain that teeth thus filled are safer from recurrent decay than those not decayed at all, because we have their rounded, golden surfaces in contact, of a material which is incorruptible. In addition to this

advantage, we have a perfectly natural and comfortable feeling about the teeth, and the original grinding surfaces restored, with freedom from the annoyances of the flat-surface treatment. Holding them in natural and normal position, we have restored that high development, that ideal form and anatomy, which intimates to us in this, as in all things, the sovereign wisdom of the Creator. I accept no system which does not include and provide, as its most important feature, the restoration of the original shape or anatomical feature of the tooth.

In proportion as the principles or methods of a system are simple, so may we expect the aids and adjuncts to be few in number; and I would therefore mention, in the order in which they come, the following, as constituting about the sum-total of the means to be employed for filling teeth, as I would use them: First and foremost, the rubber dam; secondly, the separators (if approximal surfaces are to be filled, and these surfaces only are contemplated in my remarks); thirdly, the electric mallet, as the mechanical means for driving in the gold when gold is used. I take it for granted that every dentist acknowledges the necessity of the rubber dam. As to the means for securing space between the teeth, especially where decay has destroyed the contoured points of contact, and the teeth have fallen into each other, closing together at the cervico-approximal margins, nothing for this purpose approaches in the slightest degree the new separators as perfected by Dr. Perry, of New York, and manufactured by the inimitable S. S. White Dental Manufacturing Co., of Philadelphia. In the use of these instruments in sets of four we are not only saved the tedious, tiresome, and painful plan of opening with rubber wedges, but we are at once enabled to secure the space needed, with the advantage of increasing it as the operation proceeds. On the old plan the teeth begin to close immediately on removal of the wedging material, and the space so dearly obtained is soon lost unless another dreaded and painful step is taken by driving in a wedge of wood to hold the teeth apart; and when we recount the casualties in the forms of periostitis, alveolar abscess, dead nerves, etc., it would seem that this questionable practice ought to cease. By means of the new separators the teeth are opened and held firmly, with the additional advantage of holding the rubber dam securely in place and out of the way, catching the slips of instruments, etc. We gain thus not only all the space needed in which to restore the original shape of the tooth, but in straining the teeth apart the resulting rigidity furnishes us, in proportion to the rigidity, a better resistance to the blow of the mallet, and consequently we obtain more perfect condensation of the gold. Teeth that are loose and tender, unable of themselves to bear the mallet, can be

held rigidly by these separators while being perfectly and comfortably filled. The mouth may be closed as often as desired without in the least endangering the work in hand. In insisting upon restoration of the original shape of the tooth, especially at the approximal surfaces, of course I do not mean to be understood as wishing to restore *only* those portions which have actually decayed away, but to remove all their edges and margins; to cut away and so shape them that their fragile margins may be converted into strong ones, terminating in obtuse angles rather than right or acute angles. In all conditions of approximal decay this method should be employed to a very great extent in beveling the walls of the cavity outward rather than in making them parallel, and especially rather than in forming undercuts down the sides of such cavities, which would terminate the walls in acute angles.

This treatment enables us to secure in the first place a complete and unobstructed entrance to the usually inaccessible parts of the cavity, the importance of which cannot be overestimated. Another advantage is that we are compelled to anchor our fillings in the crown and grinding surface.

As already intimated, I would depend on the electric mallet as the mechanical means for condensing or impacting gold, and, consequently, I would use only cohesive gold foil when gold is to be used The gold should be used in thin strips, not only to preserve the simplicity of the system suggested, but to secure the best results. When the mallet works well, and with the foil carefully prepared, it is capable of the finest work that has ever been done in this field. Under such circumstances the electric mallet is "a thing of beauty and a joy forever."

Dr. Knapp's paper was substantially as follows:

In spite of manipulative skill and the use of the best known remedies, it must be admitted that, as a general rule, exposure of the pulp is soon followed by the loss of its vitality. Thirty years ago there were operators who contended that the surface of an exposed pulp could be sliced off with an excising instrument, after which, with suitable dressings, it would heal by first intention; that then the cavity of decay leading to it could be filled, and that the vitality of the healed pulp would be retained as if nothing had occured to cause the destruction of any part of its substance. This theory has long been exploded.

About forty years ago the distinguished surgeon and dentist, Dr. Hullihen, of Wheeling, Va., maintained that an operation called "Risodontropy," which consisted in drilling through the cervical part of a tooth until the nerve-canal was reached and its contents punc-

tured, would usually result in the pulp slightly receding from the point of exposure at the bottom of the caries, while its vitality would be preserved through its entire length. In this view he was undoubtedly mistaken; yet a tooth so treated seldom gave trouble. If suppuration ensued the opening thus made gave ample opportunity for the escape of the vitiated secretions. During the last twenty-five years the best operators of this country have demonstrated that in the great majority of cases of exposed pulp, and especially in those cases where this delicate tissue has become diseased, it is better to remove it entirely, and fill the canal if possible to the foramen, and then fill the chamber and the cavity of decay.

It is easy to understand the philosophy of the cause of alveolar abscess, recognized in the effect of decomposing pulp left in the chamber and canal, where in its primitive condition of health it performed its important function. But when the exposed portion of the pulp is diseased and undergoing suppuration, it is idle to attempt its preservation. To effect its removal is more easily said than done. It is more easily done if that part of the crown is cut away which obstructs entrance to the canal or canals, and this portion of tooth-substance is of course to be replaced with the material used for filling. The opening into the canal should be enlarged and made funnel-shaped, to facilitate the passage of the instrument used for the removal of the contents. The barbed broaches sold for this purpose are usually too large and clumsy to enter any of the nerve-canals, except those of the anterior teeth of the superior maxillary and the palatine root-canals of the superior molars. A delicate hook may be formed at the end of a small untempered broach, and with this success is more certain. Or, take a piece of orange or osier-wood, delicately pointed, and place at the entrance of the canal, tapping it two or three times, not too hard, with a mallet; the pulp will be found either adhering to the wood on its withdrawal, or pressed to one side of the canal, whence it can generally be removed by means of a broach tightly wrapped with cotton. If there be no symptoms of a sac at the apex of the root there can be no objection to filling the canal or canals as soon as they have been deprived of their contents. If there be a sac, from an opening through the plate of bone adjoining and the superimposed gum-tissue, giving an external outlet for the escape of the pus, there is no objection to filling the nerve-cavity at once, because the abscess can be better treated through its external opening. In all cases in which pus, originating in a sac, escapes through the canal and out by the cavity of decay, the foramen must be a large one, and treatment by antiseptics will probably, in most instances, be required for a week or ten days, in order to arrest the formation of pus, achieve a healthy action to succeed the diseased

one, and prepare the root-canal for filling. Among the successful materials used for plugging the canals may be mentioned gold, lead, Os-artificiel, Hill's stopping dissolved in chloroform, orange-wood, and osier-wood. The material most easily used is osier-wood, the nicest sticks of which should be selected, and shaped as nearly as possible to fit the canal. A notch may be made around the pointed wood, at a distance from its end a little greater than the length of the canal, and after the point has been driven tightly into place it is easily twisted off at the notch. Before being driven into the canal the wood should be dipped into fine carbolic acid, for obvious reasons. In the essayist's opinion, wood may be thus prepared and used in this way to come as near filling the canal to its apex as any other material.

The subject of Operative Dentistry was now opened for discussion.

Dr. Salomon regretted that he was obliged to differ on some points from his friend Dr. Knapp, whose paper he had just read. Dr. Knapp intimates that it is next to impossible to save a pulp after its exposure. The speaker had saved fifty per cent. of his cases, and could under favorable conditions save any part of the pulp. The pulp does not fill the entire cavity. If you take out a sound tooth, say a molar, and cut it down until you come to the pulp-cavity, you will find, in patients up to eighteen years of age, a distance of from two to two and a half millimeters between the lining and the pulp material itself. In persons from thirty to forty years of age this space increases to as much as four millimeters. If the pulp is diseased, as indicated by an unhealthy color, there need be but little trouble in removing it by a sharp spoon-shaped excavator, or with a fine needle-shaped instrument heated to a white heat and pushed into the pulp. The pain of this operation amounts to nothing. Before filling the cavity, it is well to use iodoform in solution, or a preparation of bichloride of mercury, oxide of zinc, and glycerin, mixed to a paste and pushed into the chamber. The driving of wood into the canals has sometimes been successful, as described by Dr. Knapp, but the speaker had seen some outrageous operations of that kind, and he was opposed to the system. The danger is in leaving some part of the chamber unfilled, or going beyond the apex.

Dr. L. P. Dotterer, Charleston, S. C., doubted the correctness of Dr. Salomon's statement with reference to the space in the pulp-chamber, and thought it was merely the shrinkage of the contents by contact with the air. The speaker thought well of Dr. Crenshaw's paper, but his best experience had been with soft foil for cervical walls and margins, and cohesive foil for finishing. The electric mallet was a good instrument.

Dr. J. J. R. Patrick said he had listened with much interest to Dr. Crenshaw's paper, but he thought there was among dentists much unnecessary and unfortunate use of the terms soft foil and cohesive or hard foil. Pure gold is the same the world over, being one of the elements. If there is any difference between two sheets of elementary gold, it is because some alloy has been placed on the surface of one to change its character. The speaker had been in the habit of rolling out pure gold himself and filling with it, but all gold sold as pure was not absolutely pure; a slight addition of silver or some other alloy may usually be found. Annealed gold adheres more tenaciously, and so must make the better filling.

Dr. McKellops. I would like to ask Dr. Crenshaw whether he ever used any mallet except the Electric—Bonwill's, for instance?

Dr. Crenshaw replied that he had tried that mallet and many others.

Dr. McKellops. I have wanted to make a success of the electric mallet, but cannot get so delicate and perfect a blow with it as with Bonwill's. I once sat three hours beside Dr. Webb, and saw him fill a tooth with the electric mallet, and got him to change my mallet, but it was not satisfactory. I have had the best mallets and batteries that money could buy, but the result was the same. I believe the first men in the land are using Bonwill's mallet to-day. I am coming, however, to be an advocate of hand-malleting, and may become a convert to Herbst's method, which looks to me like the coming system. As to the wedging method, I have seen rapid wedging destroy the teeth and split the process. It is a barbarous practice. I go to work carefully with the tape and use other means which require time and patience, but I achieve success without inflicting much pain. The use of the matrix requires careful work. It is not merely the operation of driving a piece of steel into place It is a good thing in proper hands.

Dr. W. H. Morgan said it was a fallacy to suppose that soft gold fillings were not equal to those made of cohesive foil. He instanced a case of his own in which a soft gold filling had lasted forty years. He would ask Dr. Patrick why, after preparing and annealing his gold, he always annealed it the second time before putting it into the mouth?

Dr. Patrick replied that he used absolutely pure gold, rolled and prepared by himself, and that he annealed it again to a cherry red before using, merely to drive off any superfluous moisture. The metal, when rolled or beaten or drawn, undergoes a compression of its molecules; annealing expands them into their natural form, and the mallet again drives the particles together.

Dr. H. E. Beach, Clarksville, Tenn., was sorry to find so few dis-

posed to advocate the advantages of non-cohesive gold. You always know when you have pressed this gold into and filled the cavity with it, but you cannot take any cohesive foil ever made and cover every portion of a cavity with it. The most skillful operators no doubt combine all preparations of gold, and the best results, in the speaker's opinion, can only be had by the judicious use of both cohesive and non-cohesive gold. A good deal had been said about the use of wood, gutta-percha, etc., in pulp cavities and nerve-canals, but the speaker had heard a very eminent operator say that it made no difference what such fillings were made with, provided they were perfectly done. In the speaker's opinion, nothing answers the purpose so well as a sheet of lead. Nature seems to tolerate lead even if you drive it through the foramen.

Dr. Winkler said that his method was to copy every good system or suggestion. All systems of operating are turning out beautiful work. The operator who fails to avail himself of soft foil does himself great injustice. For all simple cavities the height of dentistry is a perfect soft gold-foil filling. The speaker always protected the cervical walls with a good matrix of soft foil. Our finest operators are looking around for some material to preserve the cervical walls previously to building them up with gold. Tin foil is good in some respects. It was surprising to find in Dr. Webb's book the statement that tin foil was a difficult material to work; evidently Webb was not well acquainted with it. But the real objection to tin foil is that it is apt to discolor the tooth, by reason of some chemical action.

Dr. Morgan said that "cohesive" and "non-cohesive" were relative terms. Soft gold is not cohesive because there is some foreign substance deposited on its surface. But any form of gold is good that fills a cavity perfectly. The speaker uses cohesive gold largely, yet he had made as good fillings with the other. He was sorry to differ with Dr. Beach as to the superiority of lead for canals. A pulpless tooth is dead, to all intents and purposes, and when its vitality is gone it can make no difference what agent you use to fill it.

Dr. McKellops exhibited a matrix and other appliances used by Dr. Herbst, and explained that operator's method of filling. There were also shown an elliptic spring matrix, by Dr. W. B. Miller; a design for a dental chart, by Dr. McKellops; a foil folder and a mandrel for small disks, by Dr. G. S. Staples; a separator, by Dr. Farr; casts showing a system of regulating with rubber and metal plates, by Dr. J. L. Mewborn; and a speeded lathe, by Dr. M. W. Williams.

The Executive Committee announced that arrangements were completed for clinics the next day, Thursday, in the library of the Watkins Institute.

Adjourned.

Third Day.

The morning was devoted to clinics by Drs. Crenshaw, Winkler, and Richards, and to demonstrations of crown and bridge-work by Drs. Patrick and How. Dr. M. W. Williams operated his speeded lathe, and Dr. J. Rollo Knapp gave a practical exhibition of his improved blow-pipe.

Afternoon Session.

The association assembled at 3.30 P. M. and listened to the reading of a paper on "Histology and Microscopy," by Dr. E. S. Chisholm, of which the following is a synopsis:

The great first cause for histological research to the dental practitioner appears in the etiology of the decay of the human teeth, and implies a thorough understanding of the physiological and pathological conditions. In other words, we should differentiate relative attitudes between these two conditions as accurately as though we were estimating distance between two localities, in order to define causation and know wherein consists the preventives or proper remedial agents, if lesion be already begun.

To a thorough understanding of these histological conditions microscopy has greatly aided us, offering the additional proof of ocular demonstration to the many other means of demonstrating facts from which knowledge is drawn. To arrive at all truth in the physical world we have but one source of evidence—demonstration. Inasmuch, then, as microscopical research depends so much upon the vision alone, it may be well to consider the uncertainty in arriving at an actual demonstration by this means.

All truths, aggregated and classified, upon a given subject, are called the science of that subject, as chemistry, anatomy, etc. But many conclusions in science, so called, have not been subjected to the crucible of actual test. Then, as so much depends upon the eye in microscopy, we can see the difficulty of arriving at positive conclusions by this means alone. This fact will account to same extent for the varied conclusions arrived at by different minds on this subject. Demonstration by microscopy alone is far more difficult, if at all possible, than in other sciences. We can easily demonstrate that vegetable acids will break down tooth-structure, but to learn what part bacteria and other microscopical discoveries play in the destruction of human teeth is not so easily demonstrated. The use of ambiguous terms which express no definite idea, and to which is assigned a power to discover which they never possess, is one of the chief causes of our slow progress towards truth on all subjects.

There being no discussion on Dr. Chisholm's paper, the subject was passed, and Pathology and Therapeutics was called.

Dr. R. B. Adair, Gainesville, Ga., who was introduced by the president as being notably successful in the treatment of pyorrhea alveolaris, stated that in his neighborhood this disease was quite common. Why it was so he could not tell. It was so rare in Nashville that he had not been able to find a case for a clinic. He thought the disease sometimes local and sometimes hereditary. He had begun his own experiments, resulting in his present system of treatment, about eight years ago. The usual surgical treatment by Dr. Riggs and others does not restore the tissues. The pockets still remain to receive irritating substances. The devices for protecting the parts, such as rubber dam, plates, etc., also fail more or less.

The speaker's method, which he had found to meet all requirements, is first to apply all over the suppurating surface and down into the pockets a saturated solution of a few crystals of iodine in pure creasote. This preparation improves with age, and not only destroys all germs but stimulates a healthy action. The next step is to prepare a glyceride of tannin by dissolving in glycerin in a small wide-mouthed bottle as many crystals of tannin as the bottle will contain. This makes a very thick solution, which must be applied all over the surface, the parts being first carefully dried; the result is that the pockets are sealed up and protected for at least twenty-four hours. The saliva forms a tannate of albumen, which covers the pockets and surfaces with a pellicle strong enough to resist friction. These two remedies must be used daily, the pellicle being first peeled off and the pockets filled as previously indicated.

The time required in this treatment depends on the severity of the case, say from ten to one hundred and twenty days. The speaker has had perfect restoration of severe cases, and would feel confident of success under his own treatment even were the periosteum destroyed for two-thirds the length of the root.

In reply to a question, Dr. Adair said that tincture of iodine would not answer the purpose of his solution.

Dr. Geo. Chisholm stated that he had succeeded very well with the method described by Dr. Adair, but patients were apt to abandon attendance before the treatment was completed. The speaker would recommend a mouth-wash as follows:

Cryst. iodine, gr. iij;
Tinct. aconite, ʒ iij;
Myrrh, ℥ j;
Tannin, gr. x;

with alcohol sufficient to make three ounces, flavored with wintergreen. Used without water, a few drops on the brush, this wash keeps the mouth in good condition.

Dr. Catching said he had succeeded by a different method. It

was his opinion that in this disease there was always caries of the margins of the processes, which should be thoroughly trimmed away. He would then apply aromatic sulphuric acid, followed by iodine or chloride of zinc, according to circumstances. The applications should be made with a brush of sable-hair.

Dr. Morgan thought it fundamentally important to get at the true pathology of pyorrhea, without which all practice must be purely empirical.

Dr. Crawford said that the trouble was to determine between true pyorrhea and local disease. He believed this disease had its origin in the cementum. If we find it in its destructive type, depending on constitutional causes or heredity, a cure was beyond our power.

Dr. Thackston referred to the old pathology of pyorrhea. In his student days it was not known either as pyorrhea alveolaris or Riggs's disease. The modern treatment is certainly a long way in advance of anything done in those days. In the speaker's opinion there was a conjoined suppuration of the gums and alveolar process, and in most cases it was a local manifestation of constitutional disturbance, of vitiated and impaired nutrition. While he believed there was no radical cure for this disease, undoubtedly it could be modified and palliated by building up and repairing the whole system.

Some further remarks, to the same general purport, were made by Professor J. Taft, Dr. Morgan, and others.

After adopting a motion to hold an evening session at eight o'clock the association adjourned to accept an invitation to visit Vanderbilt University. Carriages were in waiting, and the party, graced by the presence of the ladies and families of some of the members, was driven first to the capitol, where many of the visitors ascended to the dome to enjoy the magnificent view. Near the capitol the house and tomb of Ex-President Polk were visited. At the university the visitors were welcomed by the president, Bishop McTylere, who paid a compliment to the dental school of the university, which, he said, had outstripped all the other departments. The principal buildings were inspected, and after a stroll about the campus, said to be the finest in the world, the gratified visitors were brought back to the city.

Evening Session.

The subject of Pathology and Therapeutics was recalled.

Dr. W. H. Morgan believed there was but one cure for developed pyorrhea alveolaris, and that was removal of the teeth. He had seen no case cured otherwise. The disease is to a large extent hereditary. It seems to be local, but is merely the local manifestation of constitutional disease. He had known whole families to be afflicted with

it, including children eight years of age. Many thousands are destroyed by it or by diseases which it invites by draining away the vital powers. Pneumonia and consumption are frequent followers of it, and our physicians do not suspect it. The speaker had had a case complicated with all the symptoms of consumption; he removed the teeth, absorption took place, an artificial set was inserted, and in three months the patient's cough disappeared and the general health was restored.

In the treatment of pyorrhea, cleanliness and the removal of all irritants are the first requisites. The instruments should be passed well down to the point of union, and all deposits scraped off, producing a clean, smooth surface. For destroying fungous growths nothing, in the speaker's opinion, was equal to carbolic acid, which is also a stimulant to healthy action. In some cases he had used Robinson's Remedy, a composition of carbolic acid and caustic potash, made into a paste and applied on a loose roll of cotton about the necks of the teeth. Too frequent operations are to be avoided, as they are apt to irritate. The patient should be instructed that absolute cleanliness and constant friction of the gums by the finger are prime necessities. Always look to the diet of your patients, and build them up on the most nourishing food. There are some cases that we cannot relieve, and they should be turned over at once to a regular physician, as it is not the dentist's province to treat constitutional disease. The speaker had seen in forty years' practice only six cases of necrosed bone associated with this disease. The characteristic of pyorrhea was, in fact, not necrosis, but softening of the alveolar process. There was no such thing as absorption of necrosed bone. Such bone is dead. Absorption is, as a rule, a physiological process, and physiology relates to the living.

Dr. J. Hall Moore thought one important fact in relation to pyorrhea had been too long overlooked. He did not remember a single well-developed case of this disease that was not accompanied by catarrh of the throat or nose. He instanced a celebrated case reported some years ago by Dr. Mills, which was chronicled far and wide as an eminent success; but the speaker had subsequently seen this patient, a lady, and found pus discharging around her teeth, although they appeared to be clean and sound. Subsequently her teeth were all removed by Dr. Mills. This lady had a bad case of catarrh. Dr. Mills had frequently noticed the same complication. The speaker thought catarrh was a constitutional ailment, not curable by local treatment.

Dr. Morgan said that pyorrhea was found largely among scrofulous patients, and in blondes more frequently than brunettes.

Subject passed.

Dr. B. S. Byrnes, Memphis, Tenn., read a sketch of some incidents of office practice, and exhibited several curious extractions, viz., an inferior wisdom-tooth having club-shaped roots; an inferior left temporary molar from the mouth of a lady twenty-two years old, the posterior root entirely absorbed. In this case the adjoining bicuspid was held down by the molar and lay beside the anterior root. Dr. Byrnes also exhibited a large deposit of salivary calculus, the size of an ordinary molar, including roots, taken from an inferior left central which had a slight ligamentous attachment.

Adjourned.

FOURTH DAY.—*Morning Session.*

The subject of Pathology and Therapeutics was again brought up, and Dr. A. S. Duval, Fayetteville, Tenn., described a remarkable case in his practice having all the appearance of pyorrhea alveolaris. The usual remedies and treatment proved of no avail. The patient had formerly been much addicted to the use of tobacco, but had abandoned the habit by direction of physicians. The speaker thought that this abandonment may have had something to do with the development of the disease, and he advised the gentleman to resume the use of tobacco, which he did. The result was the speedy disappearance of all the symptoms of pyorrhea.

Chemistry was recalled, and a paper entitled "Gold, Cohesive and Non-Cohesive," was read by Dr. Theodore Johnstone, Newberry, S. C.

The following is a synopsis of the paper:

The process of preparing cohesive and non-cohesive gold for filling teeth is little known to the dental profession. It is very unsatisfactory to handle every day a valuable material which we know so little about, and doubtless every dentist would like to become better acquainted with the principles and processes employed in the preparation of his gold. The course in chemistry in every dental college should include this subject. To understand why gold is or is not cohesive is to have less trouble in manipulating it. The term "cohesion" as applied to gold, in the sense that dentists use it, seems to be a misnomer. It is derived from the Latin *co* (with) and *hærere* (to stick). Cohesion is that force in the particles of matter which connects them in such a way as to resist any attempt to separate them. It is true that pieces of the so-called cohesive gold can be made to unite so solidly and perfectly that the eye will be unable to detect the line of union; but, properly speaking, the union of the particles is by welding. There is a difference between welding and cohesion. The molecules of aluminium or zinc are held together by co-

hesion, but their elements will not weld like iron or gold. The welding property is found in very few of the metals. Gold possesses more different properties than any other metal. It surpasses all others in malleability and ductility. It is compressible, expansible, and very tenacious. Neither air nor water affect it at any temperature; the ordinary acids fail to attack it singly, although it will readily dissolve in nitro-muriatic acid, the active agent being the liberated chlorine. There are different methods of refining gold, but the one commonly adopted is as follows, when the gold is alloyed with other metals: The alloy is to be freed from all dirt. A magnet passed through the scraps removes all particles of iron. If there is much silver in the mass it is dissolved in nitric acid. The mass is then transferred to a vessel containing a mixture of one part nitric acid and two or three parts muriatic acid; heat is applied to hasten the solution; it is then filtered to separate the chloride of silver, and the filtrate evaporated nearly to dryness. This solution contains the chlorides of the remaining metals of the alloy, from which the gold is to be separated by precipitation. When largely diluted with distilled water, and a solution of sulphate of iron added, the gold will fall as a dark-brown powder, which may be collected in a filter well washed and dried. It is then fused with borax in a crucible. Oxalic acid is sometimes used instead of the sulphate of iron, and the gold then precipitates in a spongy form. As to the so-called cohesive property of gold, pure gold will, when properly annealed, weld under pressure like two pieces of iron.

The atoms of matter are so arranged that they do not everywhere touch, thus leaving interstices. These interstices seem to be occupied by heat. For instance, a piece of iron is made smaller by hammering; its particles could not be brought into close contact if there were no interstices. The iron may be made red-hot by being rapidly hammered on an anvil; the atoms being suddenly forced together, the latent heat is driven out. A metal thus deprived of its heat loses its ductility, and becomes hard and brittle. Again subjected to heat, its molecules expand, and the interstices enlarge according to the degree of heat to occupy them. Thus the metal again becomes soft, malleable, and ductile. It is for this reason that we anneal gold in swaging plates for artificial dentures. In reducing the gold to foil, we have pressed its particles together and deprived it of its latent heat. Hence it is dense and stiff, and requires annealing to expand the interstices with heat and render the foil weldable. To make non-weldable gold, we simply coat the surface of the pure metal with a substance which will prevent direct contact of its particles. Ammonia gas is sometimes used, but the best agent in common use is flowers of sulphur. It is not so readily

liberated by exposure. When, however, this gold is sufficiently heated the sulphur will unite with oxygen, and pass into the air as sulphurous-acid gas, leaving the surface of the gold pure. Sponge gold has the property of welding to a greater degree than foil, and it was this form of gold which induced the first move toward contour filling.

Dr. Morgan commended the paper, but was obliged to correct some errors of the essayist. Gold is not the most ductile of metals. Platinum is much more so, and can be drawn into wire as fine as the finest hair. It was also a mistake to assume that metal holds latent heat, which is driven off by hammering. Heat is simply a mode of motion, not an entity, and can occupy no space.

The subject was passed, and Operative Dentistry recalled.

Dr. Crenshaw said he desired to reply to some remarks which his paper had elicited. He believed the electric mallet had been abandoned by certain operators, because they were unwilling to take the time and trouble necessary to understand the mallet and battery, and keep them in good order. A little trouble is enough to discourage most people. The speaker had had his tussle, and he would reiterate that, once understood and carefully handled, the electric mallet is the finest instrument we have. Its blow is mechanically perfect, and is entirely sufficient for driving down and condensing cohesive foil. It had been said that the blow was harsh and severe for many cases. Had not those who made such statements found out how to regulate the blow? The blow of the mechanical mallet was not mechanically correct, and the speaker had seen some very poor filling done with it, and such irritation and inflammation produced that the tooth operated upon had to be extracted. It was possible to do great injury with the separators, but when used as intended, and with the exercise of common sense, no trouble need be apprehended. The matrix of soft foil in the cavity and around the margins, as described by Dr. Winkler, had been practiced by the speaker himself, but he could see no good reason for the use of soft foil. More cohesive than soft foil by weight can be placed in a cavity, which proves the superior density of the cohesive. Under the system he had described in his paper, a filling should begin and end with cohesive foil, a thing which could not be done with soft foil.

Dr. Winkler hoped the brethren would not allow themselves to be carried too much away by new gospels. He claimed that the walls of soft teeth can best be saved by soft foil. Cohesive foil will weld to soft foil, if used in small pieces and properly heated.

Dr. McKellops thought cohesive gold best in the majority of cases, but no one can do everything with one thing. Webb sometimes failed under his own system.

Dr. Geo. S. Staples believed that twenty-four out of every twenty-five dentists ought to use soft foil, because they lacked thoroughness. It requires thoroughness and skill to use cohesive gold. Dentists, like poets, are born, not made.

Dr. Freeman would go further than the last speaker, and believed that it would be better for the people if nine-tenths of the dentists used amalgam instead of gold. The speaker uses both kinds of gold. He also uses tin foil to line the margins, because it seems to produce a therapeutic and chemical action which hardens the tooth-structure. It is true that discoloration often results, but he tells his patients beforehand of that possibility, so that if other dentists notice the appearance and take it for a pathological condition, they may be warned not to disturb it.

Dr. J. Y. Crawford said that if compelled to choose one foil he would prefer the cohesive, but he would not disparage the occasional advantages of soft foil. He doubted Dr. Crenshaw's statement that more cohesive than soft gold can be placed in a cavity. Dr. Crenshaw's theory of a system was a move in the right direction. We want some such system as a standard by which to be taught, guided, and controlled. The speaker believed, however, that hand instruments were better than any mechanical appliances for making fillings. There was no efficient substitute for the hand in such operations.

Subject passed.

Dr. Catching said he had pleasure in bringing to the notice of the association the most remarkable case of dental development on record: Julia Wells, now fifteen years of age, was prematurely born in the sixth month of gestation. She was always very delicate and very small. At six months of age a small set of teeth was developed, which disappeared within three months. At eleven months she began teething again, and at fifteen months an entire set had developed, which in six weeks became dark and crumbled away like chalk. Her weight at that time was ten pounds. The child was faithfully nursed at the breast, and was given cod-liver oil and lime-water three times daily. At two and a half years of age the third set of teeth appeared, small and fragile, which was retained up to the fourth year, when the teeth were removed, with the result of decided improvement in the child's health. Some of these teeth had very small roots, others none. The girl was now toothless for a series of years, with the exception of four curious little upper incisors, shell-like and rootless, so slightly imbedded in the gum that they were easily removed with the finger-nail. At seven years of age she weighed thirty pounds. The fourth set of teeth began to

appear at the age of eleven, the eruption being completed in October last. This case had been under the care of Dr. Catching, and of Dr. T. T. Moore, Columbia, S. C. Models of the child's mouth were exhibited, one made at five years of age and one recently.

Drs. Morgan, Salomon, and Crenshaw were appointed a committee to prepare a memorial of the following members of the association, deceased since the last annual meeting: Dr. J. P. Holmes, Macon, Ga.; Dr. A. H. Best, Savannah, Ga., and Dr. M. S. Jobson, Perry, Ga.

A resolution was adopted expressing the gratification of the association on the establishment of a dental department in the Central Tennessee College for colored men, and commending the enterprise to the good will of the profession in the South.

The association also adopted resolutions of thanks for attentions shown to the visitors by the resident dentists and dealers, the trustees of Vanderbilt University, the Tennessee Historical Society, and the Nashville Art Association.

The election of officers was held, and the time and place fixed for the next annual meeting, as reported in our September issue.

In the evening the newly-elected officers were installed.

A communication from the National Dental Association, requesting the appointment of a committee of conference, with a view to promote harmony of action between the two associations, was unanimously tabled.

Adjourned to meet at Old Point Comfort, Va., on the third Tuesday in August, 1887.

EDITORIAL.

IMPLANTATION OF TEETH.

Dr. W. J. Younger, of San Francisco, has recently, in New York and Philadelphia, before representative members of the dental profession, clinically demonstrated his surprising innovation on established methods and principles of practice by boldly boring into the jaw of the living subject and engrafting therein a natural tooth which may have been extracted from another patient a year or more previously.

Dr. Younger introduced to the New York Odontological Society a lady for whom he had implanted three teeth thirteen months ago, and the expressed opinion of members present accorded to the indicated teeth a firmness and color scarcely distinguishable from similar devitalized teeth under favorable conditions of treatment and repair. One year subsequent to the operation referred to the pa-

tient presented herself for the reception of another graft, and that tooth also gave equal promise of permanence.

The operation is both novel and startling, and is of too recent origin and limited application to warrant any expression of decided opinion *pro* or *con*. We leave to Dr. Younger the detailing of his precise methods of procedure, rather than by a premature statement of our impressions regarding them to encourage a course of imperfect experimentation which might jeopardize the success of what may prove to be an important step not only in dental but in general surgery as well.

We witnessed the implanting of a right second bicuspid in the superior maxilla of a lady in the office of Dr. E. C. Kirk, of Philadelphia, and shall be afforded opportunity for observation of the progress and behavior of the case.

DENTAL LAW OF BRITISH COLUMBIA.

We have in type the full text of the act to regulate the practice of dentistry in British Columbia, which we hope to find room for in a succeeding number.

BIBLIOGRAPHICAL.

The American System of Dentistry. In Treatises by Various Authors. Edited by Wilbur F. Litch, M.D., D.D.S., professor of prosthetic dentistry, therapeutics, and materia medica in the Pennsylvania College of Dental Surgery, Philadelphia. Volume I.—Regional and Comparative Dental Anatomy, Dental Histology, and Dental Pathology. With 537 illustrations and 6 plates. Royal octavo, pp. 1010 and index. For sale by subscription only. To be completed in three volumes. Price per volume, cloth, $6.00; leather, $7.00; half morocco, gilt top, $8.00. Philadelphia: Lea Brothers & Co., 1886.

For some months past the publication of the "American System of Dentistry" has been looked forward to with more interest than had previously been excited by the announcement of any forthcoming dental work. The first volume is before us, and to mention first that which is most readily appreciated, the appearance of the book is beyond criticism,—paper, typography, and binding are simply elegant, justifying the claim of the publishers that they have studied to make the work a pleasure to the reader and a lasting ornament to his library.

The contents of Volume I are as follows: "Regional Anatomy,

etc.," by M. H. Cryer, M.D., D.D.S.; "Lymphatic Vessels of the Head and Neck," by Albert P. Brubaker, A.M., M.D., D.D.S.; "The Teeth of the Invertebrates," by W. H. Dall; "The Teeth of the Vertebrates," by Jacob L. Wortman, M.D.; "Embryology and Dental Histology," by W. Xavier Sudduth, M.D., D.D.S.; "General Pathology," "Dental Caries," "Pathology of the Dental Pulp," "Diseases of the Peridental Membrane," "Abrasion and Erosion of the Teeth," by G. V. Black, M.D., D.D.S.; "Diseases of the Dental Pulp and their Treatment," by James Truman, D.D.S.; and appended is a republication of Dr. W. D. Miller's papers on "Fermentation in the Human Mouth: Its Relation to Caries of the Teeth," etc.

Dr. Cryer, while not claiming originality for the purely descriptive matter of his chapter, has succeeded in making an admirable condensation, especially adapted to the needs of the dental student. Two hundred and ninety pages are occupied by him in a description of the regional anatomy of the head,—making a chapter which for conciseness and comprehensiveness is not equaled by any treatise on the subject of which we have knowledge; and Dr. Brubaker's brief description of the lymphatic vessels of the head and neck makes a fitting addendum thereto.

The succeeding chapter, by Mr. Dall, though brief, is full enough to meet the requirements, and gives in a few pages an intelligent exposition of his topic.

The chapter on the comparative anatomy of the teeth of the vertebrates, by Dr. Wortman, is a fine example of encyclopedic abridgment and fulness.

However histologists may differ in their theories and conclusions, it must be admitted that Dr. Sudduth has contributed an excellent chapter on embryology and dental histology,—a systematic and orderly exposition of the subject from his stand-point. In treating of "life-force" the author has indulged, perhaps unconsciously, in what may be termed a somewhat dogmatic upholding of the doctrine of special creation as opposed to the theory of creation by process of evolution. While much debatable ground is yet to be gone over before a satisfactory answer can be obtained to the question, "What is life?" it should not be forgotten that the facts already developed in biology place the doctrine of evolution beyond the limits of the term "hypothesis;" and while evolution fails to account for many manifestations of life-force, in many more instances the significance of its applications has been accepted by workers in biology as eminent as those quoted by the author. A dogmatic presentation of the theory of special creation is therefore to be condemned, as should be similar assertions respecting the doctrine of evolution, either being foreign to a strictly scientific spirit whose objective point is the truth.

The several subjects treated by Dr. Black are discussed in his usual able style, each chapter being a "teaching" paper. A more careful reading than we have found opportunity for might suggest adverse criticism here and there, but at present we will only express surprise that when, treating of the etiology of erosion, he should write that "with our present knowledge it is practically unexplainable," in view of his comprehensive, almost exhaustive, study of it, as evinced in the description which he gives, and especially when he demonstrates the existence of an acid secretion from the labial mucous membrane immediately overlying eroded teeth. Further inquiry in this direction would possibly have furnished a satisfactory solution of its etiology.

The diseases of the dental pulp and their treatment are discussed by Dr. Truman with an endeavor "to present the subject in the clearest manner possible,"—and he has, we think, fairly succeeded in the effort, making an instructive monograph on his topic.

The succeeding Volume II is promised by January, 1887, and Volume III in June of the same year. The whole will form a complete encyclopedia of the science and art of dentistry such as could not have been written by any one man in the profession.

A Practical Treatise on Mechanical Dentistry. By Joseph Richardson, M.D., D.D.S. Fourth edition. Revised and enlarged. With 458 illustrations. Octavo, pp. 703, and index. Philadelphia: P. Blakiston, Son & Co., 1886. Price, cloth, $4.50; leather, $5.50.

Previous editions of this work have maintained the front rank originally accorded it as a text-book in dental colleges and a standard manual of mechanical dentistry. If time and space permitted, it would be interesting to compare in detail the first with the present edition, as showing the advance in prosthetic dentistry since 1860,—an advance creditable alike to the profession and to the author who has so diligently garnered the fruits of the inventive genius and skill of his co-laborers. What has proved of value in the old has been retained, and what may hereafter prove useless has been given place. But for every practicing dentist, and especially for every student, there is in this volume information and instruction in every requisite to the intelligent and successful practice of prosthetic dentistry. And to this indorsement must be added large credit for the literary ability displayed in the author's presentation of both the original and collated matter comprised in the volume.

We note with legitimate pride how largely the pages of the Dental Cosmos have been used (always, however, with due credit) for both matter and illustration. This fact is significant as showing to what great extent the evolution of dental science and art is reflected in the successive issues of a representative dental journal.

As illustrative of the greatest defect in dental education—the lack of art culture—and to emphasize the necessity for improvement in this direction, we quote from the auther's preface the following paragraph, commending it to the thoughtful consideration of every dental student:

"Among the unnumbered millions of human beings who have peopled the earth since the dawn of time, it may be affirmed that no two have been created with faces exactly alike. There is the same aggregate of features, and a pervading general resemblance of one person to another, but there will be found as infinite a multiplication of distinct shades of facial expression as there are human faces, and each separate shade of expression characteristic of each one, and distinguishing him or her from all others, constitutes facial individuality. Each separate feature—as the eye, the nose, the mouth, the teeth, facial contour, complexion, temperament, etc.—contributes to this individuality, and no one special feature more, perhaps, than the teeth. There are few more repulsive deformities than those inflicted by the loss of these organs, and none more fatal to the habitual and characteristic expression of the individual. It is the special mission, as it is the first and highest duty, of the dentist to preserve this individuality intact, and an equally imperative duty to restore it as perfectly as possible when impaired. To fulfill in the most perfect manner possible this most difficult of all the requirements of prosthetic practice implies an art culture that is competent to interpret the distinct play of features associated with individual physiognomies, to differentiate individual temperaments, and make available the sculptor's and painter's perceptions of the subtle harmonies of form and color. To the failure or inability to properly comprehend the practical import or significance of individual characteristics, so far as they find expression in the teeth, and the consequent failure to conform our methods of replacement to the imperative requirements of art, may be fairly ascribed the deserved reproach into which prosthetic practice has fallen, and not, as is generally charged, to the employment of any particular material or methods concerned in the mechanical execution of the work."

Noticeable among the many additions of new matter are the hundred and ninety-three pages relating to root-crowning and bridge-work,—a subject to which the attention of the profession is now generally turned. The devices, suggestions, and alternative methods illustrated and described have a monetary value to the practitioner many times the price of the volume.

The typography and general make-up of the volume are such that the publishers conjointly with the author deserve generous recogni-

tion at the hands of the profession to which they have rendered this valuable service.

Index to the Periodical Literature of Dental Science and Art, as presented in the English language. By J. Taft, M.D., D.D.S. Octavo, pp. 212. Philadelphia: P. Blakiston, Son & Co., 1886. Price, cloth, $2.00.

The table of contents of this volume shows that it is an index to the periodical literature of dentistry, to dental periodicals, and to authors. The first division occupies nine pages; the second, one hundred and fourteen pages; the third, eighty-two pages. The author in his preface says "this work, while making no pretensions to perfection, presents to the student and practitioner a reference to the principal papers which have appeared in dental periodical literature in the English language on every subject interesting to the profession. It *has not been the intention* to catalogue every paper, but it is believed that few if any really valuable ones have been omitted." Of the index of authors he says, "It is *not intended* to be a complete list of the contributions of the various writers to the periodicals of the profession, but rather an indication of the subjects upon which papers by them may be found, and of the more important efforts."

The *italics* (which are ours) in the above extracts suggest the deficiencies of the work, and to that extent disarm criticism. The book would have been more valuable if the *intent* had been broader, but, though far from complete, it will be found valuable to these in quest of information on given subjects.

A Text-Book of Human Physiology, including Histology and Microscopical Anatomy, with special reference to the Requirements of Practical Medicine. By Dr. L. Landois, professor of physiology and director of the Physiological Institute, University of Greifswald. Second American, translated from the fifth German, edition. With Additions, by William Stirling, M.D., Sc.D. With 583 illustrations. Octavo, pp. 904 and index. Philadelphia: P. Blakiston, Son & Co., 1886. Price, cloth, $6.50; sheep, $7.50.

Professor Landois's text-book has rapidly passed through five editions in Germany, and is regarded in that country as an eminently valuable and practical work. Professor Stirling's translation has met with the unqualified approval of the leading medical journals of England, and is pronounced by the *Medical Record*, of New York, "the most complete and satisfactory text-book on physiology extant." We cannot better express our appreciation of this volume than by quoting from the notice of the first American edition by the *American*

Journal of Medical Sciences: "Our author not only teaches his pupils how and to what extent pathological processes are derangements of normal activities, but also effectively aids the busy physician to trace back from morbid phenomena the course of divergence from healthy physical operations, and to gather in this way new lights and novel indications for the comprehension and scientific treatment of the maladies which he is called upon to cope with in his daily warfare against disease." To this we may add, as expressing the special characteristic of the volume, the translator's testimony in his preface to the first English edition: "Landois's work, in fact, forms a *bridge* between physiology and the practice of medicine. It never loses sight of the fact that the student of to-day is the practicing physician of to-morrow. Thus, to every section is appended—after a full description of the normal processes—a short *résumé* of the pathological variations."

A large amount of new matter has been added to this edition, and the illustrations increased by nearly one hundred, and some of the chapters have been in great part recast.

The Teeth and Associate Parts, and what Everyone Should Know Regarding Them: Their Anatomy, Physiology, Diseases, Treatment, etc., Practically Considered. By John Wood, D.D.S., etc. With twenty-five illustrations. Edinburgh: John Menzies & Co.; Dumfries: Maxwell & Co., 1886.

The purpose of this little volume is expressed in the title, and is well carried out in the text. The teachings are sound, and the practical instructions contained in the book are worthy of the attention and observance of the public. The cuts used in illustration are the same as were published in "The Mouth and the Teeth," one of the series of American Health Primers published in this city in 1882.

Pamphlets Received.

Transactions of the Alabama Dental Association, for the sessions held in Birmingham, Ala., April 8th, 9th, 10th, and 11th, 1884; Montgomery, Ala., April 14th, 15th, and 16th, 1885; Montgomery, Ala., April 13th, 14th, 15th, and 16th, 1886. Montgomery: W. D. Brown & Co., 1886.

Galvano-cautery in Diseases of the Prostate, Bladder, and Urethra. By Robert Newman, M.D., of New York. Read in the Surgical Section at the thirty-seventh annual meeting of the American Medical Association. Chicago: Office of the Association, 1886.

Some Recent Experiences in Clinical Surgery (Illustrated by Notes of Cases, Pathological Specimens, and Patients). By Donald Maclean, M.D. Reprinted from Transactions of the Michigan State Medical Society for 1886.

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HINTS AND QUERIES.

Dental Anomaly.—Fig. 1 is a mesio-buccal view of a superior left second molar. Fig. 2 represents the same in its mesio-palatine aspect, and Fig. 3 is a coronal view. The cuts exhibit clearly the extraordinary shape and great size of this tooth, which, on the fourth day of July, 1883, I extracted from the mouth of

Fig. 1.

Fig. 2.

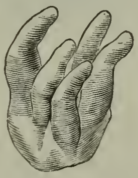
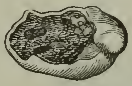


Fig. 3.



a gentleman twenty-five years of age. The circumstances were such that I did not obtain a history of the case, nor did I observe closely the character and number of the remaining teeth. I was surprised at the sight of so many long and complete roots belonging to a single tooth, extracted without fracture of root or process, while the patient was under the influence of nitrous oxide gas, and

after several other teeth and roots of common character had been extracted under the same anesthetic conditions; so that I omitted inquiries and examinations which otherwise would have been made, and in the absence of his address I cannot now supply the desired data. It is, however, doubtful if such an historical report would throw much light on the cause of this anomalous growth. There is no trace of the coalescing of two or more tooth-germs at any stage of development. It is a matter of regret that so little of the crown should have survived the attack of caries, and yet we owe to its ravages the knowledge that such an abnormality is possible. A greater number of blended roots on a single crown have been seen, but it is thought that this case stands alone in its display of five full-sized roots on one crown, of unusually large size, and having the characteristics of its class on the *right*, though found on the *left*, side of the mouth. The length of the disto-buccal root with its proper part of the crown is eight-tenths of an inch, and the circumference at the cervix is one and six-tenths of an inch.—SAMUEL KIMMELL, Philadelphia, Pa.

WOODEN NERVE-CANAL PLUGGERS.—I first get my nerve-canal smooth and clean; take a new broach that will reach the end of the root, and slip a small piece of rubber dam on the broach; then push it to the end of the root. This gives me the exact length of the nerve-canal. I then select a peg that will fit loosely and mark the length. This I dip in chlora-percha two or three times and let dry. When everything is ready I warm this peg and force it to the apex with a rotary motion. It will twist off only where it fits tight. For bicuspids or lower molar roots, pump in some chlora-percha before putting in the peg, which will force it all in place without any danger of drawing it out again.—B. Q. STEVENS, Hannibal, Mo.

A NEW DENTAL ENGINE APPLIANCE.—The soft rubber cup of which I send you a model and sketches (see Fig. 1) I have found to be a very useful appliance when fixed on a dental engine mandrel (see Fig. 2), and employed with moistened chalk or other polishing powder to clean and polish the teeth (see Fig. 3). One advantage is that under slight pressure the edge of the cup adapts itself closely to the convex surfaces of the teeth with a uniform bearing that greatly facilitates

FIG. 1.

FIG. 3.

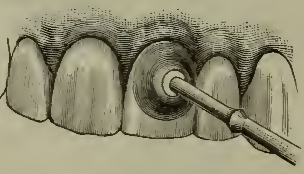


FIG. 4.

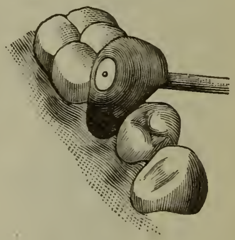


FIG. 2.

the work to be done. Another advantage of hardly less importance is that the edge of the tool or cup is not turned towards the lip or cheek as is a disk, and therefore discomfort or injury to the patient will be avoided, besides affording means for cleansing not only labial surfaces but the buccal faces as well. To reach the lingual and palatal surfaces the cup is to be reversed on the mandrel (see Fig. 4). The little appliance will certainly find favor with the profession.—J. B. WOOD, Camden, N. J.

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ORIGINAL COMMMUNICATIONS.

PROTOPLASMIC NUTRITION AND MOLECULAR METAMORPHOSIS IN THE DENTAL TISSUES.

BY ALTON HOWARD THOMPSON, D.D.S., TOPEKA, KANSAS.

(Read before the American Dental Association, August 5, 1886.)

ALL life is evolved by and in the embryonic protoplasm,—or bioplasson or sarcode,—which, in its primitive simplicity, is the basis and matrix of all animal tissues. It is that element in all the tissues which, from its first proliferation, conveys nutrition, guides development, directs tissue-building, presides over typal evolution, and after completion of the tissue maintains the integrity of its form and quality, and carries nutriment into it and waste from it to the capillaries.

But protoplasm appears in its primitive purity in very few, if any, completed animal tissues. The complexity of organization of these various tissues is infinite, and is due to the extraneous elements, organic and inorganic, which are deposited and arranged after definite typal forms within the meshes of this primeval element of all the tissues. The embryo during its earliest stages is apparently composed of protoplasm in its simplest combinations; yet it is impressed with mysterious powers of differentiation into specified organs from the fecundated ovum, in accordance with and in obedience to typal impulse. This impulse, inherent in the ovum and spermatozoa, is the great, impenetrable mystery of life. Why all the forms of all the tissues in all their multifarious qualities and compositions should assume special shapes and characteristics and powers under the impulses conveyed by the minute cells which are the foundation of the organism—we cannot understand, unless, indeed, we fall back upon the interference of a supernatural power above and beyond our ken.

In the evolution of the organism the protoplasmic compounds, which are first proliferated as the basis structure, select from the

stream of nutrient pabulum flowing through it from the capillaries the particular elements which may be necessary for the elaboration of each tissue; each protoplasmic molecule of each tissue working under its own differentiated impulse, whether it be building bone or nerve tissue, muscle or tooth enamel. The protoplasm then remains as a permanent element of each tissue, and gives it life; it carries in the nutriment and takes out the waste. The superior, the complex elements of the tissue are therefore dependent upon the vitalizing protoplasm, not only for creation, but for subsequent support and maintenance. The complex elements make each special tissue what it is, that it may perform its allotted work in the economy of the organism. But when the vivifying protoplasm perishes, the other elements quickly die, for through it they live and move and have their being, and perform their appointed duties.

All animal tissues which lose their protoplasm through any process of evolution or exfoliation—such as the epithelial structures—become isolated and are dead. They are attached to the organism, but have no life and exist unaltered if totally separated from it. It is still a mooted question whether the enamel, being an epithelial though calcified tissue, should be classified with the vital or the exfoliated products. That it is totally devoid of life throughout its substance we cannot believe, nor yet that it is vital to its periphery. Perhaps a middle ground would be most nearly the truth. That it is vital is proved by the organic areas of protoplasmic elements which have been demonstrated to exist in it when the life of the pulp is maintained; but when this organ perishes the enamel becomes as dead as hair or hoof cut off from nourishing elements.

In applying these observations concerning protoplasm to a study of the teeth, we find that, like other tissues, the dentine and enamel have each been developed from a specially modified protoplasmic matrix, which in its earliest form is nearly pure albumen. With the mysterious impulse imparted to the formative pulps, they intelligently select from the pabulum the organic and inorganic elements required for the proper construction of these tissues, which are so wonderfully elaborated in all their details in accordance with typal commands.

Dentine seems to be much the same tissue as bone in regard to its chemical elements, but is very different in its morphology. It is formed in a protoplasmic matrix of excessive vascularity by the reduction of the supplied lime-salts in globules formed in successive capsules, which are pierced by the fibrils, around which permanent tubuli are formed. Spaces are sometimes isolated by the aggregation of globules, and in these there is often nothing but protoplasmic elements, but as a rule these interglobular spaces are filled solid by

calcification. This form of calcific globules can be imitated experimentally by precipitating lime carbonate in any viscous fluid, but especially in fluid albumen, which comes nearest to the animal matrix. On the periphery of the dentine we find irregular granulations and spaces also, as the foundation for the more regular forms of precipitation. Throughout the whole tissue the protoplasmic elements persist as the living organic matrix which, by connection with the mains, the contents of the tubuli of the dentine, the fibrillæ, which are in their turn the persistent protoplasm, conveys nutrition into the tissue and waste from it, and incidentally conveys sensation to the pulp.

The enamel is formed in a manner analogous to that of dentine but yet dissimilar in detail, as the tissues are dissimilar in chemical composition as well as in morphology. Enamel is a calcified epithelium, or at least it is formed in a protoplasmic sub-basis, which is the result of a metamorphosis of epithelium. This basis is embryonic protoplasm, and within its substance is formed the tissue which is to be the inclosing capsule of the crown of the tooth when thrust beyond the gums. The salts of lime are deposited and arranged in a specified manner, according to the transmitted impulse, and in an organic matrix of horny matter,—*keratine*. It appears that there are areas of living-matter throughout this tissue,—perhaps, indeed, a reticulum of protoplasm penetrating the substance of the prisms themselves,—but at least so far as it is living-matter it contains protoplasm, and this conveys nutrition. Through this the enamel is nourished, however limited and minute this and the corresponding removal of waste may be; the main fact being that nutrition and waste are exchanged within the tissue to some extent by means of the connection of the living-matter of the dentine with the periphery of this tissue.

The power by which the movement of fluids in the protoplasm of the tissues is maintained is the function of osmosis, inherent in protoplasm. Upon this depends the flow of the fluids which create and continue life in all animal organisms,—even that highest elaboration of protoplasm called man. For, after all, animal forms are but modified sponges, which draw fluids through the meshes of their tissues to strain out the nutritive matters contained therein and, casting their waste products into the stream, pass it onward.

It is through this faculty of osmosis inherent in all tissues that continuous currents are maintained. The well-known example of an animal diaphragm separating two dissimilar fluids which commingle more or less through this membrane, illustrates this. The membrane by a power all its own, a capillary affinity, draws the fluid within itself. That is called *endo*smosis. Then by another ac-

tion—repulsion—it sends the fluid onward and outward—expels it. That is *ex*osmosis. If now we carry this conception to the living membranes and tissues within the body, we will observe that they too possess this power of osmosis; that they absorb fluids—pabulum—from the capillaries by an attraction,—an affinity,—and then expel them by a repulsion equally strong, thus maintaining the currents. The change of polarity of the fluid must take place within the tissue to account for the sudden switching from attraction to repulsion.

Probably the hunger of the tissue for food causes it to draw the pabulum, and having absorbed the nutriment it craved and thrown the waste into the current, the fluid becomes offensive, and it is expelled with equal force, thus maintaining a vacuum and acting with the precision of the positive and negative poles of the magnet. This power of attraction and repulsion must vary with the vitality and density of tissues, of course. Thus, the nervous substance being more vital and vascular would require and attract more nutriment and throw out more waste, and we find this to be a physiological fact; and bone being less vital and more dense in structure would attract less nutrition and throw out less waste. By the power of osmosis we believe that the circulation of the blood and other fluids of the body is aided and accelerated, and that the attraction and repulsion so exercised on the blood by the tissues is the missing link in the chain of causes inducing the movement of the blood in its circuit.

We cannot but conclude that this function is present in all tissues; that it is one of the inherent properties of protoplasm and of all its compounds. We know, indeed, that all tissues are nourished by the circulation; we know that they throw their effete matter into the veins to be carried off; we know that all compounds of protoplasm possess the power of osmosis in both directions; we know that protoplasm is the basis of all tissue, and hence conclude that this element has most, if not all, to do with the osmotic nutrition of the tissues.

And so, as there is living-matter within the tissues of the teeth, and this living-matter must be protoplasm or its simple protean compounds, we cannot but assume that the dental tissues are nourished by the ever-present and ever-acting powers of osmosis. We know that osmosis, of course, begins at the capillary walls, the limit of the red blood-corpuscle's excursions, and that the pabulum is carried by that power to the innermost parts of the tissues, and that waste is carried back to the capillaries and there thrown into the veins, the sewage system of the economy. We know also that this osmotic circulation is maintained within the bones, by which the currents flow through the protean contents of the lacunæ and canal-

iculi, and the bone thereby nourished and molecular changes effected even in its calcific substance. We know also that this circulation is maintained in the fibrillæ of the dentinal tubuli, and that life is thereby sustained in the dentine. As the tubuli anastomose with the canaliculi of the cementum at the periphery of the dentine, and the circulation is continuous between the two tissues, we depend upon this circulation for the maintenance of life sufficient for the toleration of the tooth by the living tissues about it after the removal of the life-source of the dentine, the pulp. We expect it to preserve not only the life of the cementum intact, but also to maintain some vitality in the dentine in contact with it.

But further than this, it has been conclusively demonstrated that there are areas of living-matter in the enamel, and that this living-matter is in direct connection by an anastomosis more or less regular and continuous with the contents of the dentinal tubuli. If this be true, then indeed there is osmosis by which nutrition is conveyed to the enamel, however minute and inappreciable it may be.

If this circulation exists by the inherent powers of osmosis in the protoplasm or protean organic elements of the dental tissues, then we must hold that molecular change is possible within limits that could make such change appreciable. If the tissues can be fed and their waste products carried off by this osmosis, then must molecular change be possible in the dental tissues as in other tissues, through physiological variations within health-limits; but especially in favorable pathological conditions of the circulating fluids would these tissues be subject to alterations.

A few of the ordinary evidences of this alteration might be cited in illustration. First, it is well known that the teeth at eruption are not so dense in structure, so rich in inorganic elements, as at maturity. Again, this density usually increases with age and active employment, so that the dentine of old age and the dentine of adolescence are very different in quality. The former is nearly devoid of protoplasm, and the very fibrils become calcified to some extent, and often the pulp itself; while the latter, though morphologically perfect is very incomplete chemically, and possesses a large quantity of mere protoplasm, which will need to be calcified before the dental tissues will reach their mature texture.

And if this calcification can take place after the tooth is erupted and morphologically complete, we must believe from analogy that the polarity can be reversed and *de*-calcification be possible under the incitement of pathological conditions. Even physiological change of the circulating fluids, such, for instance, as occurs in pregnancy, induced perhaps by lime-starvation, may cause molecular change, for we have reasons for believing that lime is taken from the teeth

and bones for the construction of the osseous system of the fetus, and that it is returned after this function is completed. Indeed, the molecular disturbance of the entire system is very great and very appreciable, physiological activity everywhere being accelerated during the continuance of the creative function. And after this, during lactation, there is also disturbance of a somewhat different kind, a lactic prevalence and a draining of the system of its general food stores when the required lactic elements are not supplied by the digestive and assimilative powers in sufficient quantity to meet the excessive demand. In both conditions a molecular breaking down occurs, and the resulting food is appropriated by the growing child.

Again, we know that the teeth of patients which have been in good, dense condition for years, requiring very little treatment at our hands, will suddenly and often without apparent cause take on a condition of unaccountable softening, and caries will progress with uncontrollable rapidity. What it is that causes this remarkable change, what it is that acts through the circulating fluids to disintegrate and carry off the lime-salts, we do not know. But it is a molecular change of some sort,—a retrograde metamorphosis which simulates a return to the embryonic condition,—a breaking up of molecules for *re*-formation of elements which may have a destiny as food to other parts of the system, or it may be to form purely waste products.

Molecular metamorphosis is at once the wonder and the mystery of modern physiology. Recent investigators have completely revolutionized our ideas of even such simple things as the digestion and assimilation of foods. "The older physiologists assumed that the flesh of the meal was directly, without great effort, and without much change, so far as the chemical composition is concerned, transformed into the muscle of the eater. The researches of modern times, however, go to show that the substances taken as food undergo many changes and suffer profound disruption before they actually become part and parcel of the living body, and conversely, that the constructive powers of the animal body were grossly underrated by the earlier investigators. If we were to put forward the claim that the proteid of the meal becomes reduced almost to its elements before it undergoes synthesis into the superficially similar proteid of muscle, the energy set free in the *de*struction being utilized in the subsequent work of *con*struction, we would not anticipate modern research but a brief time, for it would almost seem as if the qualities of each particle of living protoplasm were of such individual character that it had to be built up fresh almost from the very beginning. The problems of physiology in the future will be largely concerned in arriving, by experiment and inference,—by the

mind's eye and not by the body's eye alone,—at a knowledge of the molecular construction of this protean protoplasm, of the laws according to which it is built up, and those by which it breaks down; for these laws when ascertained will clear up the mysteries of the protean work which the protoplasm does. All over the body the protoplasm is constantly building itself up out of the pabulum supplied by food, and continually breaking down, giving rise to different tissues and combinations in different parts of the body, with different compositions and different properties, the various activities of the body being the outcome of the various properties of the various combinations. If this be true, it inevitably follows that protoplasm cannot be the same everywhere, but that there must be many varieties of protoplasm with different qualities, and with correspondingly different molecular structure and composition." (Michael Foster.)

But as to this molecular metamorphosis in the substance of the tissues,—both constructive and destructive, progressive and retrogressive,—we cannot yet witness its methods, but only its phenomena. "We are taught by physiologists that there is a constant splitting up of the molecules of which the body is composed. This breaking up is accompanied in health by corresponding building up of tissues from the food after assimilation. For instance, the bones lose their phosphate of lime to which they owe their solidity, the salt passes into the blood and is there eliminated by the kidneys. The brain also loses phosphorus. Now, the food should, if appropriate and duly assimilated, supply an abundance of the phosphates, —ample, indeed, to bear the strain imposed upon the phosphorus resources of the body. But this supply being insufficient, or digestion or assimilation being imperfect as regards the phosphorus salts, a phosphorus famine begins and the body feeds upon itself and consumes its own phosphorus. So a general malnutrition may reäct upon any specified parts of the organism by abducting its constituent salts, albumen, or other matters, and thereby lessen its resistive power to disease; and the teeth are organs peculiarly liable to suffer from this general malnutrition, inducing a chronic starvation, and by lowering their vitality and robbing them of much of this reserve store of materials render them more liable to caries." (Ed. *British Jour. of Dental Science.*)

Molecular metamorphosis is the cause of every act and process of nutrition and removal of waste. Indeed, it is certain that a "wasting of its tissues" *is* wasting,—a removal of integral parts by molecular breaking down, but the expected replacement does not follow. In certain diseases assimilation and molecular construction seem to be held in abeyance, while breaking down and waste still

go on, either normal or abnormal, and in other conditions again waste is lessened and construction goes on, with corresponding increase in the quantity or density of the tissue. These operations we observe in the dentine, and perhaps they take place in the enamel. As there is nutrition and waste by osmotic currents in these tissues, there must be molecular change in accordance with general law. The teeth cannot be exceptions to a rule among vital tissues in this regard. There can be waste of the inorganic elements of the dentine and probably of the enamel, and when this removal is not followed by compensating reconstruction of lime phosphate molecules, softening of these tissues results, with corresponding lessening of resistance to the attacks of caries. Then, again, there may be increase of density, as transpires with age, by a more rapid construction than waste. If molecular progression and retrogression are continuous in normality, then is metamorphosis omnipresent in the dental as in all other tissues.

Addenda.

In the condition known as inflammation in the dentine, we have a molecular activity which seems to be a breaking down and removal of lime-salts, then of its organic matrix, and then in healing a reconstruction of both occurs. "Inflammation causes solution of the lime-salts, and afterwards a liquefaction of basis-substance, both in bone and dentinal substance. The result will be the appearance of globular spaces, a bay-like excavation, which, instead of being filled with basis-substance, exhibits medullary corpuscles, multinuclear protoplasmic masses, corresponding to the embryonal stage of the tissue . . . Suppuration may result, but far more common is the healing process of eburnitis, the results of which may be seen in the formation of dentine closely resembling secondary dentine, or a dentine destitute of canaliculi,—osteo-dentine." (Heitzmann and Bödecker.) What this inflammatory condition is we will not stop to consider, but it will suffice for our purpose to direct attention to the intense molecular activity that takes place, the breaking down and then total removal first of organic and then of inorganic elements, and then the following of molecular synthesis, by which the basis-substance, as well as the calcified elements, is reproduced again. Here is a molecular work which cannot for a moment be doubted, and, while we observe its operations with wonder, we cannot but regret that the mystery of its *modus operandi* is yet impenetrable.

SURGICAL DISEASES OF THE TONGUE.

BY H. A. SMITH, D.D.S., CINCINNATI, OHIO.

(Read before the American Dental Association, August 5, 1886.)

All along down from the first records of medicine the appearances of the tongue have been studied in connection with morbid conditions of the system. This organ being brought to the view of the dentist in his operations on the teeth, its appearance in health and disease, if properly studied, would often enable us to advise our patients as to whether the peculiar appearances presented are due to local conditions present in the mouth or to sympathy with the alimentary canal, or perhaps with other parts of the system.

But it is not with the medical aspect of the subject that it is our purpose to deal, but rather with the surgical diseases of the tongue.

The tongue, situated as it is in the floor of the mouth, is surrounded by the teeth. These, if healthy and intact, form a protecting wall to shield it from harm, but if diseased or broken down they become the veritable cause of a variety of diseases of the tongue; and when the tongue is subject to organic disease, it in turn becomes an offense to the teeth and may cause their destruction.

In this connection we may mention *parasitic affections* of the tongue. While animal parasites are rarely found on the tongue, it may safely be said that no tongue, however healthy, is free from *vegetable* parasites; and yet Butlin states that there is but one disease, so far as he knows, due to the presence of a vegetable parasite, namely *thrush*, a membranous disease not only of the tongue, but of the inside of the mouth generally. The disease depends upon the presence of a fungus (*oidium albicans*), which is identical with the oidium lactis, the ferment of the acid fermentation of milk.

These two parasites being morphologically alike, we should expect to find in the mouths of children who are attacked with thrush after the teeth begin to erupt that caries would be more prevalent with those who are fed with a spoon than those fed with mother's milk. In children artificially fed the mouth shows more constantly an acid reaction. In the act of sucking the saliva is secreted in larger quantities, and being alkaline, the acidity of the fluids of the mouth neutralized to a degree not found in children fed with a spoon.

The condition called *furred tongue* was formerly regarded as nearly always a sign of disease; variation in the extent and color of the coating indicating the particular form of disease.

Greater weight must be given these appearances in diagnosis of disease if we consider this deposit of fur as proceeding from a secretory process of the tongue itself (Wood) than when we accept the modern view that fur on the dorsum of the tongue, whether in health or disease, is essentially a growth of fungus (chiefly of micrococcus and bacillus subtilus), and that the epithelium and food débris usu-

ally present are unimportant and accidental constituents (Butlin).

The vegetable spores found in the fur are deposited in the filiform papillæ of the tongue from the food taken in the mouth, as well as from the inspired air, and finding a favorable habitat the germ grows with surprising rapidity, especially at night when the tongue is comparatively still.

We have frequently noticed a considerable layer of fur on the tongues of patients for whom we have operated during the first morning hour, and have seen it rapidly disappear from the agitation of the saliva, frequent rinsings of the mouth, and motions of the tongue induced by our operations on the teeth.

Frequently the tongue is prevented from being cleansed in the natural way by the absence of one or more teeth on the side of the mouth, by the roughened surface of a tooth, or the presence of diseased teeth that are sore to the touch, thus preventing sufficient movement and friction against the teeth to cleanse the tongue. If a person eats on one side of the mouth, the tongue on the opposite side will show more or less furring. Mr. Hilton attributes this furring of the tongue to disturbance of function and nutrition by reflex action through the influence of the fifth nerve. But, as Mr. Hutchinson remarks, most of these examples of unilateral furring may be explained by mechanical action.

The tongue is subject to quite a variety of ulcers. Of the traumatic variety, those that are caused by the teeth wounding or irritating the tongue frequently come under the care of the dentist. Unless the patient is subject to chronic glossitis, these simple ulcers are speedily cured by removal of the cause of the disturbance, a very simple operation frequently, as by carefully smoothing the jagged edge of the tooth or by extraction. If the ulcers are caused by badly-fitting artificial teeth, the substitution of a better set will generally cure the trouble.

Ulcers which form on the under side of the tongues of children attacked by whooping cough, and which are supposed to be a specific lesion of the disease, may be, we think, explained by the irritation caused by the rubbing of the tongue against the lower teeth during the paroxysms of coughing.

A recent writer in the *American Journal of the Medical Sciences* says the action of amalgam fillings when coming in contact with the tongue may cause a whitish aphthous patch from epithelial thickening and erosion. Most likely this appearance is brought about by roughness of the filling or margin of the cavity acting as a mechanical irritant upon the surface in contact with the filling.

Aphthous ulcers are frequently met with upon the tongue and mucous membrane of the mouths of adults, but they are more common in children; and it is still a moot question whether or not th

disease is contagious. If a specific parasite is always present in aphthous ulceration, then it is possible for a dentist, unless proper antiseptic precautions are observed, to convey the pathogenic germ from an aphthous patient for whom he has operated to the mouth of another susceptible patient.

Cancer of the Tongue.

Among the exciting causes of *cancer* of the tongue usually mentioned by writers are bad teeth, ill-fitting plates; coarse, hot, and highly spiced food; the constant friction of the mouth-piece in using a tobacco pipe, chewing tobacco, and the injudicious use of caustics in treating sores on the tongue (Butlin).

The relation of the disease to age and sex is somewhat striking. Statistics show that it is hardly known in young adult life, while it is quite common between the ages of 40 and 70.

We have mentioned the irritation caused by jagged edges and rough surfaces of the teeth as a cause of cancer of the tongue, and it may be noted in this connection that the teeth during the period of life between 40 and 70, if neglected, are most likely to take on the conditions tending to injure the tongue. To the hard usage and greater neglect to which the teeth of men are subjected, we may, in part, attribute the marked frequency of carcinoma in males over females. Baker, who gives a record of 293 cases, states that of these only 46 were females.

Another explanation of this difference in the liability of the two sexes to cancer of the tongue, is that women are not given to drinking, smoking, and chewing, as are men.

Carcinoma may attack any part of the tongue; but the fact that it is most frequently seated in the parts in contact with the teeth, emphasizes the importance of giving attention to these organs in diagnosis and prognosis of this disease. The following table, taken from Butlin, shows the parts of the tongue in which cancer is most frequently seated:

Of 80 cases he finds in the

Root	1
Anterior half and top	3
Right border	12
Left border	17
Left side	16
Right side	11
Border	1
Dorsum	15
Right underside	2
Left underside	1
Whole tongue	1
Total	80

Here we have, out of 80 cases, 30 situated in the border of the tongue; and of the 27 seated on the side, it is probable that most of these were upon the border also, and that a closer analysis of these cases would show that the anterior half of the border is much more likely to be affected than is the posterior half.

This plainly shows that the teeth, when neglected in middle life, instead of affording a protection to the tongue as intended by nature, are frequently the cause of a disease the usual prognosis of which is death.

The question whether or not the habit of smoking predisposes to cancer of the tongue, is now frequently asked. Butlin says: "There is no evidence with which I am acquainted which will prove that carcinoma is really much more common among adult males who smoke than adult males who do not smoke." Yet I think it not improbable that smoking does to a certain extent predispose to the disease.

The same author remarks that it is not often that chewing tobacco can be credited with producing carcinoma, yet he mentions a case in which "carcinoma appeared on the part of the tongue where the quid of tobacco habitually rested." If the tongue was first made sore by a roughened tooth, the irritation would be kept up by the mechanical effect of the quid of tobacco in contact, and carcinoma would eventually result.

Diagnosis of lingual cancer is rendered quite difficult, because of the resemblance of syphilitic ulcerations, of tubercular ulcerations, of fissures of the tongue, and sometimes of simple ulcers, to carcinoma; and moreover, the difficulty is increased by the fact that certain of these diseases are transformed into carcinoma by almost imperceptible gradations.

In all doubtful cases the microscope is the most valuable and reliable aid to diagnosis.

As dentists, our attention is frequently directed to the pre-cancerous conditions of the tongue. If a lesion of the tongue is discovered, every possible source of irritation should be searched for, and as carefully removed. And since the most common of these sources of irritation are associated with the teeth, the dentist by recognizing the pre-cancerous condition of the tongue, and removing the cause of the irritation, may prevent a simple ulcer of the tongue from developing into carcinoma.

ESTHETIC DENTISTRY.

BY W. STORER HOW, D.D.S., PHILADELPHIA, PA.

THERE are some phases of operative dentistry that have not received due attention at the hands of writers and teachers who have hitherto undertaken to describe in detail the various departments of dental practice. It may, therefore, be deemed admissible to set forth, somewhat minutely, a series of operations which were initiated in an experiment upon the writer's own central incisors in the year 1854. The subject is capable of but imperfect illustration because of the difficulty of delineating for the engraver the shades of tooth-expression which slight changes in outline will impart, and to that hindrance must be added the impossibility of placing before him the living subjects to be represented by his art. There is, nevertheless, a reasonable probability that, by even imperfect depiction and description, a fair idea may be conveyed of what will prove an attractive study to the dentist who would become also an artist in the correction of what may be termed mal-dental expression.

The present effort will be chiefly confined to an exhibit of some of the changes for the better that may be made by merely abrading the incising or masticating surfaces of the teeth when they present certain abnormalities of configuration and relation. In every observed instance of this kind, a careful preliminary study is necessary in order that the results of the contemplated operations may not disagreeably surprise both the dentist and the patient; a warning suggested by the case of one lady who, after a considerable corrective abrasion of the superior centrals, was found to lisp quite badly,—a defect which fortunately disappeared in the course of a few days. Nothing but careful study and experience can develop the artistic sense to a degree that will enable one to forecast the shades of expression that it may be desirable to give the patient by well-considered alterations in the length and edge-shape of an oral tooth or teeth. The following examples throw some light on the subject.

Fig. 1 exhibits an instance of the effect of an habitual and excessive biting of thread, and in Fig. 2 is seen the result of an abrasive operation. In cases such as are illustrated here study lines may be drawn with India-ink on the natural teeth, but are not always worked up to, as from time to time the effects produced by progressive steps in the process are to be carefully observed, and the original plan not infrequently modified. Similar diversions will also be produced by the indisposition of the patient to submit to changes proposed. The change from the configuration of the original of Fig. 3 to that of Fig. 4 was a very great one, and accompanied by the pain that is always consequent upon abrasion of

the zone between the enamel and the dentine of a living tooth, but the young man bravely bore the infliction, as *mortification* had set in long previously when his lower lip carried two deep dents made by the projecting central incisors, which had obtained for him the nickname of "Walrus." No pain-obtundent has proved effective during the progress of such of these operations as involved this peripheral nerve-zone, and only time has sufficed to destroy the subsequent sensitiveness to hot, cold, or hard ingesta. Time has, however, in every observed instance been found to heal without destroying such teeth, the extent of the artificial abrasion having in no case been sufficient to encroach upon the immediate vicinity of the dental pulp.

An example of a very considerable degree of excision is shown

FIG. 1.

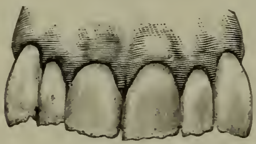


FIG. 2.

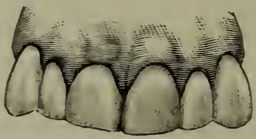


FIG. 3.

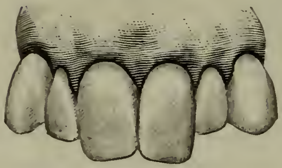


FIG. 4.

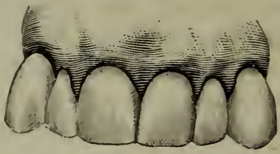


FIG. 5.

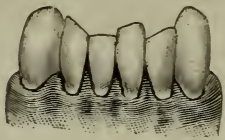
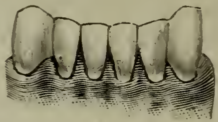


FIG. 6.



by Figs. 5 and 6. The inferior incisors are often subjects for the exercise of this art by reason of their apparent proclivity to the assumption of irregular and projecting positions, the unsightly effects of which may not seldom be quickly corrected by suitable abrasive means.

Fig. 7 represents a class of dental disfigurement occasioned by a disturbance of the process of dentition, and Fig. 8 shows the same after grinding and polishing manipulations have been successful in obliterating the marks of the disease.

Cases occasionally appear in which the oral teeth are kept an eighth of an inch or further apart by the premature occlusion of the molars and bicuspids on one or both sides of the mouth, which thus

remains partially open to the great discomfort, disfigurement, and interference with the speech of the afflicted person. Other means might avail for the correction of this deformity, but not infrequently it could be quickly remedied by heroic grinding of the propping teeth. This might easily be accomplished by the use of stump corundum wheels and points.

Fig. 9 represents a case in which the most marked improvement is made evident by Fig. 10. Fig. 11 is the type of a numerous class of cases wherein a dog-like or wolfish expression may be trans-

Fig. 7.

Fig. 8.

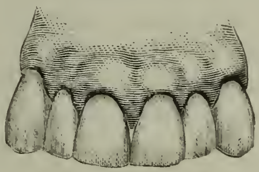


Fig. 9.

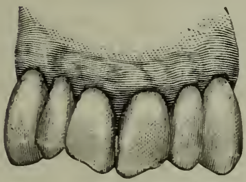


Fig. 10.

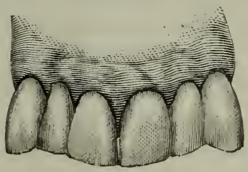


Fig. 11.

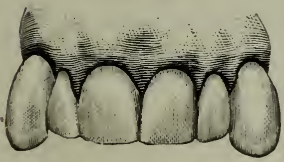
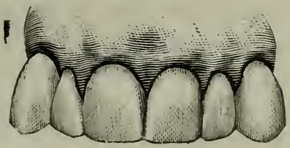


Fig. 12.



formed into a benign cast of countenance by the change of tusks into cuspids (see Fig. 12).

The harmonies of facial expression relative to and as affected by the teeth should engage the earnest regard of the modern dentist. Everything nearly or remotely contributive to the production of symmetry and comeliness in place of unsightliness should command his professional interest and attention, with the certain prospective stimulus of due appreciation and reward. An operation of the kind under consideration evoked from the beautified matron, as she stood before the mirror and thought of the many mortifications the dental asymmetry had occasioned her during the long period extending from girlhood to wifehood, the cry, "Why did not some one do this for me before?" and again and again did she repeat the

exclamation, as if she *must* live over her life in the light of this unhoped-for emancipation.

A young lady whose teeth were much exposed by smiles or laughter was the subject of corrective abrasion in addition to the healing treatment of inflamed gingival margins, and upon her Christmas visit at home she was told, "One thing is certain,—at Miss Blank's school they are taught to wear their mouths." The skill of the dentist was to the speaker an unknown factor in the transformation.

Concerning details of a method of procedure, it remains to be said that, when any considerable part of a front tooth is to be removed, a coarse, double-cut, quarter-inch, square, safe-sided file is employed, and used no longer than it has keen teeth, because the accompanying disagreeable sensations, either before or after the sensitive zone is reached, are much more easily borne while the file is made to cut quickly and keenly. As the vicinity of an adjacent tooth or teeth is approached, the safe side of the coarse file is not deemed safe enough, and a piece of very thin, smooth steel is inserted between the teeth as a protective barrier, to insure against any chance diversion of the file. The angle at which the file must be held to give the proper bevel inward, and the constant employment of the push cut to avoid chipping the external surface of the enamel, are points to be kept constantly in mind. Frequent rests for inspection will prevent excessive abrasion and relieve the strain upon the endurance of the patient, who should not be permitted to see the work during its progress, but induced to reserve comments until the final touches produce the desired results.

When comparatively little of the enamel is to be removed from the cutting-edge of a tooth, the stump corundum wheel or point will serve the purpose; but, as a rule, these edges are best shaped by safe-sided, flat files, of various grades of cut, and for finishing the corners, which in outline contribute in the greatest degree to the expression of character in a tooth, a smooth file, having a safe knife-edge, like Murphy's No. 15, is indispensable in connection with the sheet-metal protector between the teeth, or a separator like Dr. Perry's. It is well to be sure that the file-edge is safe by grinding it smooth and thin on the side of a corundum wheel.

For grinding out depressions like those shown in Fig. 7 suitable corundum points are to be used, followed by Hindostan and Scotch stones and wood polishing points. In some cases the brown discoloration at the bottom of a pit can be best removed with a copper point and fine corundum powder.

Modern dental engine appliances in brush, wheel, cup, and disk forms, and made of many different materials, permit a choice of ef-

fective means for polishing every portion of abraded tooth-surface, and such final finish should always conclude every operation of the kind herein described and shown.

By the use of separators immediate access can be had to the sides of crowded or malformed front teeth, and abrasive means employed to improve the shape and readjust the relations of those teeth in a manner that shall at once become apparent in a more pleasing expression of the mouth, and in furthermore increasing the expectation of continued service for the teeth thus polished and readjusted.

The illustrations intimate the probability of some future compensations for the lamentable disfigurements of the modern prosthetic Vulcan, inasmuch as by those cuts and like instances is demonstrated the possibility of frequent improvement upon the shape and relative proportions of the natural teeth by simple means within the ready reach of the dentist who will train his eyes to the discernment of every defect thus remediable, and cultivate to the highest degree attainable the art of esthetic dentistry.

CROWN AND BRIDGE-WORK.

BY G. W. MELOTTE, ITHACA, N. Y.

Modern crown-work has just claims to attention as a means for restoring to usefulness teeth that otherwise would be lost. The old wood pivot has given place to a variety of metal attachments, while combinations of gold, platinum, and porcelain enter largely into the construction of crowns. Inventive genius has been exercised to such a degree, in furnishing so great a variety of methods, that it has become a difficult matter to decide which is best in a given case, as many of them are practicable, requiring only skill and judgment in the application.

Acquaintance with the diseases of the mouth attending or resulting from pulpless teeth is a prerequisite, together with a knowledge of the treatment necessary for the restoration of such teeth to a clean and healthy condition, before crown-work can be expected to prove successful, for no merely mechanical skill will suffice.

Bridge-work is the natural outgrowth of crown-work, and marks the period of the greatest advance in prosthetic dentistry hitherto made. Those who have the mechanical skill necessary for the proper construction of this class of dentures, with professional judgment for determining the cases in which they are admissible, have at hand a means of restoration which cannot fail of due appreciation, as some dentists and many patients are able to prove by incontrovertible testimony. I offer myself as a witness in both capacities,

having made numerous pieces, and comfortably worn a bridge which has rendered effective and cleanly service for nearly four years. I have, in fact, devoted much time and thought to this work; struggling with difficulties harder to be overcome than in any other operations; meeting discouragements and failures enough to develop caution; yet still able to report a degree of success that warrants a confident continuance in the work. I am, therefore, prepared to submit for consideration some points of improvement in the formation of crowns and means of anchorage in bridging.

Fig. 1.

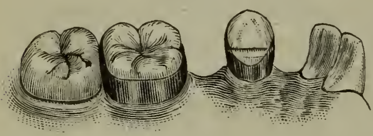
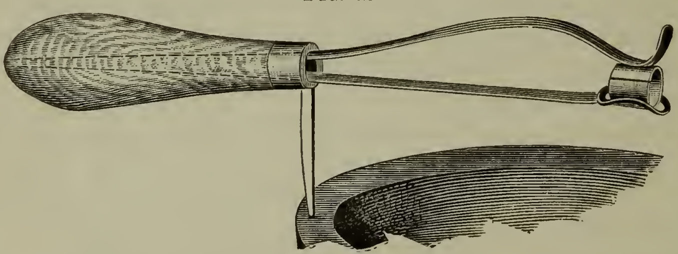


Fig. 1 illustrates a case for the supply of a lateral and a bicuspid. In this instance the cuspid could be cut off, and the root collared and capped in combination with a pin entering the enlarged pulp-canal; but, as there may be grounds for objection to cutting off sound teeth, I obviate the necessity by cutting a shoulder on the lingual portion of the cuspid, and suitably shaping its sides to permit a close fitting of the collar just under the free margin of the gum. A narrow strip of pure pattern tin, bent tight around the tooth-neck, and cut through with a knife at the lap on the labial surface, will serve as a measure for the length of a strip of 22-carat gold plate, No. 29 thick, and as wide as the length of the distal side of the cuspid. The ends of the gold are then squared, and with round-nosed pliers brought evenly together, to be held in flush contact by the soldering-clamp shown in Fig. 2. The soldered collar, with its joint side inward, is

Fig. .2



then adjusted on the tooth as accurately as possible, giving slight blows with a mallet until the collar touches the gum, when it should be marked to indicate the necessary trimming to conform it to the gum contour. After it has been thus trimmed, the edges beveled, the labial part swelled with contouring pliers, and the lingual part cut down to about one-tenth of an inch in width, the collar is again driven on, and will appear as seen in Fig. 1. A stump corundum wheel is then used to grind a shoulder on the lingual surface of the

tooth, grinding also the edges of the collar flush with the shoulder. The collar is again removed, and a piece of thin platinum plate, about No. 32, sufficient to cover the lingual surface of the tooth, is caught on the lingual edge of the collar by the least bit of solder, and all put in place on the cuspid (see Fig. 3). The platinum should now be burnished on to the shoulder, and over the tooth and collar to the extent shown by the lines in Fig. 3. After trimming to those lines, and careful replacement and burnishing on the tooth, the collar and half cap are removed, filled with wet plaster and sand, and the platinum soldered to the gold. It is then placed on the tooth, burnished into all the inequalities of the tooth, very carefully removed, invested, and enough solder flowed over the platinum to cover and give it strength. Fig. 4 shows it complete on the cuspid.

I have feared that a detailed statement would imply a long and tedious process, but I have often made such collars in less than an

Fig. 3.

Fig. 4.

Fig. 5.

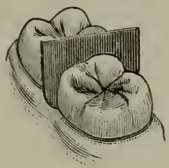
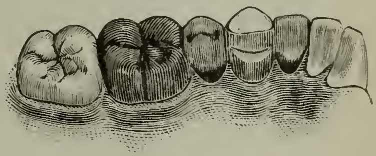


Fig. 6.



hour, and in any case time must be made subservient to exactness of fit and adaptation to the end in view.

In the preparation for fitting a collar on the first molar (Fig. 1), I should have wedged or otherwise separated it from the second molar, so that a piece of sheet brass might be put in place, as shown by Fig. 5, and an impression taken in plaster, which if allowed to get hard would bring away the metal. If not, it could be replaced in the plaster. Melted fusible metal, when near the cooling point, is then poured into the impression, and when cold will allow the safe removal of both the plaster and the metal strip. On this metal model a collar can be formed that will accurately fit the molar, as seen in Fig. 1. If the molar has no antagonist, a cap may at once be struck up on the model; but if there be an antagonist the cusps of the natural molar should be removed by grinding at points where the occluding tooth will admit of sufficient thickness of the gold cap. An exact copy of the ground cusps can then be made in less than five minutes, by the use of Moldine with its accessories, and the process is as follows: Make the tooth perfectly dry. Put the collar on it. Nearly fill the cup with Moldine, and coat it with soap-stone powder. Press the compound on the tooth and collar firmly to about one-fourth the depth of the tooth. Carefully remove the cup; trim

off any overhanging material, and place the rubber ring over the cup to about one-half the depth of the ring. Melt the fusible metal and pour it as cool as it will run from the iron ladle. As soon as the metal is hard, remove it with the ring, taking care not to impair the impression, which can be used again if the die is found imperfect or gets injured in use. Place the die and ring in cold water, to remain until quite cooled. While the die is wet and held over a basin of water, pour into the ring fusible metal which has been stirred until it begins to granulate, and quickly immerse all in the water. The die and counter-die should separate readily by tapping them with a hammer, but if they stick others can be quickly made from the same impression, by the same method, using more care. With this die and its counter-die, a piece of No. 29 or 30 gold plate is swaged to fit perfectly the cusps and collar, which, when removed, can be held to its place on the cap by the soldering-clamp, using spring pressure enough merely to hold them together for careful soldering with the pointed flame so as not to unsolder the collar. The seamless collars are excellent when care is used in selecting the proper size, as directed on the diagram.

The caps being in place on the cuspid and molar, an impression is taken with plaster; the caps accurately set in the impression, and hard wax melted with a hot spatula around the edges of the caps. The impression is then thoroughly coated with sandarac varnish, after which it is dipped for a moment in water, and filled with a wet mixture of one part marble-dust with two parts of plaster; using great care to perfectly fill the caps and molds of the teeth. Wait until this mixture has become quite hard; remove the cup, and with a suitable knife chip off the plaster without marring the cast; secure a good articulating impression, and transfer it to the cast to obtain an exact reproduction of the relative occlusions of all the teeth involved. With such an articulation in hand, and with the means already described for swaging gold or platinum plate to fit the cusps and articulating surfaces of either the natural or artificial teeth, it should be within the capacity of any competent dentist to complete a suitable bridge; although there are practical points that can only be imparted by clinical instruction and actual demonstration in the mouth. Such a bridge is shown in position by Fig. 6.

PROCEEDINGS OF DENTAL SOCIETIES.

AMERICAN DENTAL ASSOCIATION.

(Concluded from page 704.)

THIRD DAY.—*Morning Session* (Continued.)

SECTION VI, Physiology, Therapeutics and Materia Medica, was called, and the report was read by Dr. John S. Marshall, secretary of

the Section. The report noted a case of ovarian tumor, in which was found a partially developed jaw, a large number of more or less perfectly formed teeth, and a mass of long hair attached to the jaw. The specimen was removed by Dr. Halley, of Kansas City, and the case reported by Dr. C. B. Hewitt, of the same place. The report announced that Dr. J. Hooper, of Louisville, Ky., would read a paper describing a number of surgical cases, and Dr. A. W. Harlan, of Chicago, one on "Bacterio-Therapy."

A supplemental report called attention to a case of anchylosis to be described by Dr. D. J. McMillen, of Kansas City.

The report also stated that the chairman had been instructed to ask for another appropriation of two hundred dollars for original scientific investigation, the amount to be expended under the direction of a committee consisting of Drs. Harlan, Marshall, and Brophy. The committee was instructed to employ some gentleman of acknowledged ability to take up the study of Pyorrhea Alveolaris, and to make microscopic examinations and chemical analyses of the cementum and the concretions and exudates about the roots and alveoli of the teeth affected with this disease, and also to make similar examinations and analyses of the saliva and urine of the same patients, a careful record to be kept of each and every case with the results of the examinations and analyses.

The report was adopted after adding the "cementum" to the list of tissues to be investigated.

Dr. Harlan, chairman of the Section, then read his paper. [This will appear in full in our January number.]

Dr. Hooper described three surgical cases, as follows:

Case I. On the 18th of June, 1885, Dr. W. O. Roberts, an eminent surgeon, called to see if I would assist in an operation of the exsection of the inferior dental nerve.

I consented, and we decided to perform the operation on the 22d day of June, when it was conducted, after the administration of chloroform, by Dr. Roberts, cutting through and exposing the bone from the mental foramen to the angle.

I then with a fissure-bur, commencing at the mental foramen, cut down to the nerve-canal, until the nerve was freely exposed. As the bur became clogged with blood and bone, it was cleaned with the file-brush, while our assistant sponged the blood away. After the nerve was freely uncovered it was pulled out with a hook and two and a half inches cut off, as you see it in this phial of alcohol.

The wound was dressed with horse-hair drainage, and in ten days the patient was able to leave for her home in the country, and has since suffered no pain.

Here are some photographs taken a year after the operation. You

can see what a small cicatrix there is, as I have both side and front views.

History of the Case.—Mrs. Neighbors, fifty-four (54) years of age, suffered with what she supposed was neuralgia, and at different intervals had her teeth extracted until all were taken out, but the pain returned and was very severe. She would send for her physician and often the pain would leave before he reached her, but would soon return and finally got to be constant, even liquid food causing intense pain. It was finally decided that the only chance of relief would be from the exsection of the inferior dental nerve.

She has had perfect health since the operation and has suffered no pain, the only inconvenience she experiences being a slight numbness of the chin, with a tingling sensation.

Case II. This piece of necrosed bone I removed from the left inferior maxillary of a boy twelve years of age. The trouble originated in an abscessed tooth which was improperly treated and extracted. The abscess came through the outside, and was treated for nine months by a physician, who proposed to chloroform the patient and scrape or cut away the diseased bone, but his parents objecting to chloroform or ether brought him to me to see what could be done for him. I treated him a few days until the inflammation was reduced, and then saturated a piece of cotton with a four per cent. solution of cocaïne and placed it in the fistulous opening and let it remain ten minutes. I then repeated this treatment, after which I cut in and took out this piece of diseased bone with some smaller loose pieces. He seemed to suffer no pain and the wound healed in a few days.

Case III. Here is a cast of a lady's mouth with an enlargement of eighteen months' standing. Several physicians had treated her, and it had been lanced several times, but did not go away. I think the impression was made that it was a cancer and she was sent to a surgeon to be operated on. He saw it was an abscess and lanced it and then telephoned me to ask if teeth would produce such trouble. I answered yes. He then brought her to my office. My diagnosis was a dead pulp in right central incisor. I questioned the patient, asking her if she had ever suffered with toothache. She answered that she had not. I then asked her if she had ever received a blow or fall. She at first answered no, but after thinking awhile said that she had once fallen down stairs, but several years had passed since then.

I drilled through to the pulp-canal and found a very offensive, thin, watery pus. The case yielded very readily to treatment, and in four or five days she said she felt like a new person. She had suffered very much with headache, had a fullness in the face, and was

hard of hearing. In this time the headache had left entirely, also the swelling of the face, and her hearing was very much improved.

Dr. McMillen. The skull which I hand around shows what is thought to have been a case of congenital anchylosis of the jaw on the right side. The skull was that of a negro, who was killed at the age of forty years, by being thrown from a window. He was of intemperate habits, and was intoxicated at the time he was killed. The autopsy revealed the condition shown. The osseous union, as you see, was complete. The trouble is supposed to have been congenital, as when the subject was first observed by medical men, at the time he was about five years old, the immobility of this side of the jaw was absolute.

The subject was passed, and Section VII, Physiology and Etiology, was again called.

Dr. W. Storer How, of Philadelphia, read the following paper on "Litmus Tests of Oral Fluids with Chart for Recording Observations":

Briefly stated, it is the present purpose to initiate and cultivate the habit of making tests to determine the acidity, alkalinity, or neutrality of the contents of the mouth at different times, and under varying conditions, in order that such recorded tests may be collected, collated, and tabulated to an extent which shall prove of practical value to the dentist, in pointing him to the cause, the character of, and the cure for the dental lesions he may be called to consider.

In the light of tabulated and verified information of this kind, it will become the first duty of the educated practitioner, on the advent of a patient, to make and record these oral tests, so that by comparison with the statistical record he may be enabled to decide with a degree of scientific precision what remedial measures are requisite for the case in hand; or, if a series of tests shall be a pre-requisite for the proper determination of the question, then these will be made in the way and at the times proved to be reliable and indicative by the method under which the previous data have been collected.

As a hint of what may reasonably be expected, it is probably safe to predict that the choice of a suitable filling-material for cavities caused by dental caries will finally be fixed by positive information as to the acidity or alkalinity or neutrality of the immediately related parts, and of the adventitious matter liable to association therewith.

Entirely new filling-materials may be devised when once the elements of the problems to be solved are brought within the province of exact knowledge.

New and delicate reagents will doubtless be discovered under the stimulus of a quickened desire for sensitive and accurate tests.

Beyond question it will be found to be of advantage to encourage and develop a habit of careful and thoughtful preliminary observation and record relative to the condition of the mouth and teeth in every case presented, and in that belief this confessedly imperfect and incomplete chart is introduced, with the hope that further study and experiment will lead to the general adoption of a complete and uniform system by means of which a great advance will be made in the scientific theory and practice of dental surgery.

The blank form or chart now submitted provides for the recording of observations and tests by a system of notation or by diagram, the former being preferred as admitting of a supplemental record of observation not included in the chart. It will probably prove desirable to have the charts in book-form when the details shall have been perfected.

A condensed description of the method of procedure is printed in the chart, but further explanation will subsequently be added in the shape of a printed sample record.

Dr. A. H. Thompson read a paper on "Protoplasmic Nutrition and Molecular Metamorphosis in the Dental Tissues," which will be found at page 729, current number of the Dental Cosmos.

Adjourned to 8 P. M.

Evening Session.

After the usual routine business, Section VII was again called, and Dr. H. A. Smith, Cincinnati, read a paper on "Surgical Diseases of the Tongue," which will be found at page 737, current issue of the Dental Cosmos.

Dr. A. H. Thompson read a paper on "Pathological Heredity and Gouty Teeth."*

Dr. Ingersoll. What explanation can you offer of the term hereditary disease?

Dr. Thompson. I mean inherited disease,—*i. e.*, transmitted from parent to child. That is briefly all the explanation there is to it. Disease is inherited just as directly and positively as form, feature, or temperament.

Dr. Ingersoll. I doubt very much that disease is transmitted. We talk about consumption and a variety of diseases being inherited. I question the propriety of any such expression. I can understand

* See Dental Cosmos for November, 1886, p. 683.

that diathesis or tendency to such and such pathological conditions may be transmitted. As an example, I knew a gentleman in early life who had upon the top of his head a wart, which was developed when he was about forty years of age. He had a son who, at about forty years of age, had a wart in precisely the same locality. I understand by that the tendency in the child to a development of its father's peculiarities. How often is it the case that whole families grow up in apparently vigorous health, without the slightest sign of pulmonary disease in early life, who die one after another at the age of fifteen or twenty or thirty or forty, the whole family dying at nearly the same age, showing an inherited tendency, but not inherited disease? I have no doubt about the importance of this question with reference to all classes of diseases, not excepting those of the teeth. I believe that the parent is the type of the child in every fiber of every tissue, and that there is no diathesis which is not subject to inheritance; not that decay is inherited, but that the peculiar tendency to decay may be inherited and may develop at certain periods of life. I have observed this in a great many instances. I was filling a tooth of a young lady of about seventeen, a lateral incisor, upon the anterior approximal surface. While I was filling the tooth I said, "I believe I have filled the corresponding tooth for your brother." "Yes," she said, "you also filled the corresponding tooth in my sister's mouth. My father and two of my uncles have lost theirs." The decay itself was not inherited, but at a certain period of life it developed in the mouths of one after the other of the family.

A lady, a noted singer, came to my office for treatment of the disease that is now falsely termed pyorrhea alveolaris,—the old term, *peripyema*, I like better,—and while she was in the chair she said, "I am extremely anxious about this tooth, for my brother has lost his, my sister has one in a worse condition than mine, and I am afraid I shall lose mine." The tooth was not at all decayed, but was very loose. An attorney came to my office with an excessive wasting of the gum and alveolar process of the lower incisors. He said, "I am going to lose them,—I know I shall, for my father and my grandfather lost theirs in the same way."

Such cases illustrate the inherited tendency of which I have been speaking.

Dr. Morgan. I think my friend, Dr. Ingersoll, has been playing upon words a little. How often you find the son the exact type in his mental make-up of the father. Is that not inherited, or is there just a tendency in that direction? This stamping of the character of the parent upon the children is called, among horsemen, *prepotency*, and it depends upon the nervous organization much more than

upon the physical. It requires a strong, positive nervous organization to make the transmission. In 1836 Justin Morgan brought an animal into Vermont. His descendants have been crossed and crossed until 1886, and I can show you in my neighborhood now animals possessing the same qualities that the original horse did, the same character of temper, the same power to endure, and the same gait, when there is scarcely a drop of the original blood in the animal. I think there is an inheritance in that direction. It is true, as he states, that disease itself is not transmitted, but the tendency to it is. With reference to the subject of diseases that manifest themselves upon the gum and tongue, I would say that a few years ago a physician in my city who was suffering from these aphthous ulcers upon the gum and cheeks, I found, upon examination, to have six or eight quite soft amalgam fillings in his mouth. I had frequent occasion to treat the ulcers, and I found they were always in the locality of the fillings. I replaced the amalgam fillings with gold, and his trouble was entirely cured. That is the only case I have seen in a practice of forty years. These ulcers are usually the result of some depraved condition of the fluids of the body. That there is a parasite concerned in their production I have no sort of doubt. The very fact that they almost universally yield to arsenical treatment satisfies me that there is some parasite concerned in their production. Many cases may be relieved by arsenical waters. The very worst cases of what is known as nursing sore mouth may be relieved by arsenical treatment if there is a moderate condition of health, so that I take it that that disease is the result of a germ, either present in the mouth or in the general organism, which makes itself locally manifest, and this germ may be destroyed by arsenic. Cancer it is hardly worth while to discuss, but it may be remarked that such ulcers are greatly aggravated by the habit of smoking, and men who have treated such cases universally deny their patients the use of the pipe or the cigar during treatment. Two celebrated cases have occurred among our public men within the last year that have attracted universal attention. In the case of a prominent man in my city it was feared the disease would develop in the same direction, but it was arrested by early treatment. In this case, a wisdom-tooth that had been worn down so that it presented a very sharp angle against the tongue caused great irritation, which was aggravated by the use of a very strong pipe. A rigid course of treatment, with which I was not familiar,—for I was only called upon to treat the tooth,—relieved the gentleman, and he is still alive. I only know that arsenic was one of the remedies used. In cities where young people are confined in manufacturing establishments, and deprived of out-door exercise and pure air, you will find this dis-

ease manifesting itself much more frequently than among the rural population, or among those who are accustomed to out-door, active life; and especially in the malarial districts wherever the inhabitants show a little fullness of the stomach or abdomen, with cadaverous faces, you will find that there is great manifestation of this disease.

Dr. Brophy. I wish to say a word upon the subject of the disease that Dr. Smith has spoken of as cancer. I think we meet it more frequently in its incipiency than some of us are aware. It has been my lot to see a number of cases within the past few years, and I have found nearly always, where they were supposed to have been aggravated by smoking, that the teeth were worn, sharp, and jagged, and had lacerated the tissues, permitting the action of the nicotine, or perhaps some other element of the tobacco or other irritant, to come in contact with the parts and excite them to an extent which promoted an outgrowth of new tissue having no physiological purpose, and which resulted in the development of that species of cancer termed epithelioma.

Twice during the last year I have removed a section of the lower lip for the cure of epithelioma. Once, four years ago, I made the same operation, taking away about one-third or nearly one-half of the lower lip, and there has been as yet no recurrence of the disease. I feel pretty well satisfied in my own mind that epithelioma is a local affection, but if permitted to go on without treatment it develops into that malignant condition which soon terminates in death. Within the last month I have removed an epithelioma on the left side of the lower jaw, which had its origin, I am convinced, in a broken tooth upon that side. The tooth was extracted, and yet the disease continued to develop. In operating, I thoroughly removed the affected parts, as I thought. The second and third molars were removed, together with about one-half of the body of the lower maxilla on the left side. The parts seemed to heal very kindly, but in the case of the last tooth, the third molar, I failed to remove the very terminus of the socket, and here, a few weeks later, a little red jutting out of cells seemed to form that looked quite angry. By means of a scraper I removed not only this inflamed tissue but the bone in contact with it, and so far it has not returned. This convinced me that the pericementum and all of the periosteum in immediate contact with these parts, or indeed for quite a little territory about them, ought to be thoroughly removed. After operating upon these tumors, I have almost invariably used chromic acid for the purpose of destroying any diseased tissues which may have been left. I believe that when these operations are made properly the prospect of prolonging the patient's life for a number of years is very good, and in the case I referred to first, which I oper-

ated upon three or four years ago, I believe there will be no recurrence of the disease. This form of cancer, if it may be called cancer, develops very fast. One case that I have in mind reached the size of a hickory-nut inside of three weeks from the time it first made its appearance. Some gentlemen may say that the individual had within him the tendency toward the formation of these tumors and toward the development of epithelioma, and that they would have occurred if there had not been any source of irritation, but that is simply an assumption, something we do not know anything about. It seems to me that this disease is on the increase, but those who have been devoting much time to the study of the subject tell us that such is not the case, and hold that it was as prevalent many years ago as at the present time.

Dr. Ottofy. I wish to call attention to the paper read by Dr. How in this Section with reference to the natural condition of the saliva. I think that all authorities agree that the saliva in its normal condition is or ought to be alkaline, but dentists who conduct examinations, as a general rule, find at the chair that this is not the case. This is an important matter. In all the examinations I have made I have found a large percentage acid and a large number neutral, and only a very small percentage alkaline. If the active principle of the saliva is intended to exert the influence upon food which I believe it does exert, it is of importance that it should be alkaline when mingled with the food. That apparently is not the case with a large number of people. The food and saliva are in contact so short a time in the mouth before passing into the stomach that its action must be rapid. Where the saliva is entirely acid, it certainly is of no consequence whether food has been insalivated or not. Another reason why we should determine the physiological condition of the saliva is as to its relation to decay. It would facilitate the settlement of the question whether the germ theory has as much to do with caries as some think it has. Dr. How has some blanks here which he is willing to give away to members so that these examinations may be conducted in the office. It seems to me very important that such observations should be made in sufficiently large numbers to certainly establish beyond the slightest doubt what the normal reaction of saliva is.

Dr. Harlan. It seems to me that, with our present knowledge of the germ theory of disease, the explanation of the acidity of the saliva may be found in the products of the germs. The recent experiments of Dr. Black, of Jacksonville, Ill., have shown conclusively that quite a large number of germs are acid producers, and that they and their products become mingled with the saliva. If germs cause the saliva to have an acid reaction, what is the natural method

of correcting or avoiding that? It seems easy enough. If we keep the mouth clean, free from germs, food, and the chemical products of decomposition, there will be no destruction from acid.

Dr. Smith's paper upon diseases of the tongue was very timely. Too little attention is paid by oral surgeons and dentists particularly to the condition of the tongue. This member is quite as essential, I fancy, to the individual as the teeth. Otherwise we would not have such a great number of distinguished orators in this body. The tongue is subject to disease, and it is a fearfully disgusting, dirty member in the mouths of many people, who should learn how to keep it clean. The tongue inevitably becomes the subject of disease if this care is not observed, or if the teeth are allowed to decay or to become coated with tartar. I think that there are very few gentlemen in this audience who ever attempt to treat any, even the simplest, lesions of the tongue, except perhaps those of syphilitic origin. Why is this? It is because they say, "Oh, this is not my province; the little diminutive organ (tooth) that is at the other end of my excavator is the boundary of my horizon;" and hence pay no attention to it. Many times people not having their attention called to the condition of the tongue suffer a loss or a partial loss of this organ. Therefore, I think it necessary that we should give greater attention to diseases of this nature. I personally do not believe that tobacco has the slightest effect in producing carcinoma, but that the initial lesion is acquired from other causes. That tobacco may assist in prolonging or keeping up the irritation after once the process is begun, perhaps is true.

Gouty teeth or the tendency to the development of gouty teeth, or the hereditary transmission of the taint, has been referred to. The leisurely class in the United States of America is very small. The great proportion of men are so intensely occupied in this country that few of them ever acquire gout. Their minds will not allow it. Many dentists and physicians and lawyers are dyspeptic. Dyspeptics do not become gouty, as a rule. So the generation that is to follow us, or the second or third from the present time, is not likely to inherit a tendency to gouty teeth. It will be two hundred or three hundred years before that will come around, and as the schoolmaster in Ohio said, we will "let posterity take care of itself." But we will teach it how to avoid the effects of heredity that *are* likely to prove disastrous.

Dr. James Truman. I was surprised to hear the statement made that in the largest proportion of mouths the saliva was of an acid character. I have been in the habit of testing the oral secretions for quite a number of years, and my experience and observations are directly the opposite. The secretions of the mouth, according to

these, are almost invariably neutral. I allude now to the combined fluids and not the reaction given as they enter the mouth from the glands. The secretions give an acid response only under certain conditions. That fermentation and increased development of germ-life contribute largely to this change there can be no doubt, and a prominent factor in aid of this is absolute rest. This is found in all depressions and on all approximal surfaces. In this fact lies the foundation of dental caries. I have given very considerable attention to the matter, and the investigations I have been able to make have abundantly justified the conclusion as stated. When, therefore, do we have the greatest amount of rest in the mouth during the twenty-four hours? The answer would naturally be, during the period of sleep. The secretions in the largest number of cases are limited in quantity. The result is a marked increase of acidity at this period. This opinion is based on tests made in the same mouths at various periods, and particularly at night immediately after a long sleep. This acid condition will account for much that has been unexplainable by the ordinary theories of caries. I allude to abrasion, erosion, etc. It will also throw much light on some other obscure matters,—the absence, for instance, of an acid reaction in cavities during periods of greatest activity, while the destruction of tissue continues. I am satisfied that any theory of caries that fails to take into consideration the periods of partial or absolute cessation of the flow of the fluids will be unsatisfactory.

Dr. Atkinson. So far as the records go we are in the deepest kind of a muddle for the want of alphabetical arrangement of the means of pronouncing stages of production, nutrition, and destruction of the elements of tissues. In one word, it is a matter of education. Molecules are educated, and if molecules lie at the base and are the first points of the stored radiancy by which all action takes place, we ought at least to stick one stake that we need not take up. I am aware of the complications, the difficulties in which we are, by reason of very earnest seekers for the truth in molecular changes having pronounced what they saw as finalities, and being led to mistake the alternation of conditions of foresteps in protoplasm, throughout all the modifications of the exercise and combination of stored energy by which we classify this embodiment of that energy in the ratio of their simplicity and complexity in the educational condition, the registry of which has been called heredity. Every man has spoken from his stand-point, and it would require more time and patience and preparation of mind than the members of this body possess to even tolerate the tabulation of the alphabetical statement that we must comprehend and utilize before we are masters of infection and contagion, life and death. I hear it

on every hand that microbes are the immediate cause of disease. They are the antecedents of unhealth. I did not hear anybody say that any microbes were the antecedents of health. If microbes in their retrogressive activities bring about the disturbance of molecular change in living, sentient bodies, that we call disease, shall we forget that it was this very alternation of agents from micrococci all the way up that laid the possibility of the longevity of the beautiful organism that we call the human body? We are beginning to be a little bit awake to the fact that there is something that we have not yet comprehended, and that no one has even attempted to denominate, that is efficient cause. We know nothing but antecedent and sequent. We do not know causes, and it is a misnomer to say we do. Where is our difficulty? My friend from Kansas is tangled with his nomenclature. How many protoplasms did he give us? An indefinite number. Protos, *first;* and plasma, *mould of, an image.* Can there be but one protoplasm in the beginning sense? He did not tell us how protoplasm was rotated out of something that was before it in the organism into that heterogeneous homogeneity that we call pabulum, that is distributed throughout the system and is the food of all the tissues. Had we studied these a little more closely we should have understood a little better that it was not this particular little house in which the embodiment of energy displays the metamorphosis in the combining of molecules and their breaking up, and the aggregation of these into corpuscles, and these into tissues, and these into organs, and these into systems, and these into the embodiment of consciousness that operates the whole. We say the liver secretes bile. Bile is secreted in the liver. We say the salivary glands secrete saliva. Let us get rid of false nomination and throw aside these embryonal facts that are but the foresteps to arrive at what we are trying to pronounce, that which is going on in the mind of every investigator, so that we can in our investigations communicate to others the mental processes through which we ourselves were *carried.* How do molecules of water come into existence from two gases? Was there the molecule in existence before it was in existence? Yes and no. It was in *esse*, as an eternal verity, without beginning and without end, H_2O. What brought H_2O together so as to reduce it from gaseous to liquid form? The desire for combination and the energy to be combined existing in the hydrogen and the oxygen being awakened by a current of electricity, passed through the positive to the negative pole, arouses, engages, and marries these atoms into molecules, and that is the first step, and we call water the universal solvent. When we get into such a mass condition as saliva, gastric juice, intestinal juice,—that is, chyme and chyle and blood,—and then carry it through the system and resolve it

into pabulum and into protoplasm, and then into embryonal corpuscles, we have the little bricks to build all the rest of the tissues. And they talk as if one food were necessary for the brain, and another food for another part of the body. It is no such thing. If you have that heterogeneous homogeneity that we call pabulum, that is the complete embodiment of the stored radiancy in the various foods that we use, the power that they receive from the sun being held in them, and the acquisition of satisfaction, the quietness, the sleepiness being produced in that pabulum carries that pabulum anywhere into the territory of needy tissue, and the affinities will express themselves by something that we want by their own name.

Dr. Thompson. I believe that diatheses, cachexia, idiosyncrasy, and what-not abnormal conditions, are but diseases attenuated; and to distinguish between diseases and predispositions of various kinds we need to consider them as varying only in quantity, but not in kind; that is, diseases are transmitted as disease; diatheses are transmitted as attenuated diseased conditions, which will light up into active disease on provocation, or on the attainment of a certain age; or predisposition or idiosyncrasy to certain disease is transmitted as a still further attenuated form of disease, and which may never become anything worse, if the favorable conditions for its further development do not arrive.

Dr. Ingersoll knows that infants are born with syphilis; syphilis is transmitted directly in a virulent form. He knows, too, that tubercle is transmitted as a latent disease, which will in time develop, and that other diseases are transmitted directly as impressions or predispositions. But the subject is too vast, and I only wish to insist that diathesis, predisposition, etc., are but disease attenuated or latent.

Dr. Atkinson. I would like to ask Dr. Thompson if he ever saw tubercle in any germ?

Dr. Thompson. The impression is transmitted. Of course the tubercle itself is not, but the latent germ is in the ovum, and it will incubate and develop.

The report of the Executive Committee was read, offering several amendments to the constitution, and asking for their immediate adoption. Consent being refused, they lie over for one year. The following are the amendments proposed:

Amend Article IV by striking out all after the second sentence.

Amend Article V, section 6, by inserting the following at the end of the first section: "through its secretary, whose sole duty it shall be to keep a correct record of its proceedings," and by striking out the word "they" in second sentence and substituting for it the word "it."

Also in same section, second paragraph, head sub-committees, after the words

"three members of this committee shall," interpolate the words, "under the direction of its chairman"; and strike out the last sentence in same paragraph.

Same section, last paragraph, heading "chairman may convene the committee," add the following words: "and at any other time at the request of two members of the committee."

Adjourned to 9 o'clock, Friday morning.

FOURTH DAY.—*Morning Session.*

The association was called to order at 9.15 A. M., President Barrett in the chair.

Dr. Peirce reported from the Executive Committee a resolution discountenancing the giving of banquets, excursions, entertainments, etc., by local professional societies or individuals, either during or at the close of the annual meetings, which was adopted.

A resolution, offered by Dr. John S. Marshall, of Chicago, recommending to the various dental colleges that the interests of higher education demand that the college course of instruction be uniformly extended to nine months in each year, was referred to the Section on Education.

The selection of the next place of meeting and the election of officers was then proceeded with, resulting as reported in the DENTAL COSMOS for September.

On motion of Dr. Marshall, it was decided to appropriate two hundred dollars each to Sections IV, V, VI, and VII, to be expended for original research.

The usual votes of thanks were adopted, after which the newly-elected president, Dr. W. W. Allport, of Chicago, was installed, and briefly acknowledged the honor conferred upon him.

[During the sessions a number of changes in the composition of the various Sections were made, by unanimous consent. Following is the order as now arranged: I. Prosthetic Dentistry, Metallurgy, and Chemistry. II. Dental Education, Literature, and Nomenclature. III. Operative Dentistry. IV. Histology and Microscopy. V. Materia Medica and Therapeutics. VI. Physiology and Etiology. VII. Anatomy, Pathology, and Surgery.]

Adjourned to meet at Asheville, N. C., on the first Tuesday in August, 1887.

FIRST DISTRICT DENTAL SOCIETY, STATE OF NEW YORK.

THE First District Dental Society of the State of New York held a special meeting, Tuesday evening, September 7, 1886, in the rooms of The S. S. White Dental Manufacturing Co., Broadway and Thirty-second street.

Dr. W. W. Walker, chairman of the Executive Committee, in the absence of the president and vice-president, took the chair.

Incidents of Office Practice.

Dr. Reese. I would like to explain a method of filling with amalgam which is somewhat different from the ordinary way. After excavating the cavity as usual, but without depending much upon undercuts or retaining-points, I mix the amalgam ready for use; then dry out the cavity with the chip-blower and warm air, keeping it dry by placing bibulous paper around it. I now put into the cavity and against its walls some of Weston's oxyphosphate cement; then pack the amalgam carefully in, squeezing out all the superfluous material and covering the whole surface of the cavity. After that I trim the edges all around, so that none of the oxyphosphate is exposed; then finish the filling in the usual way. I find that teeth filled in this manner keep their color, no matter if the pulps are dead; and I also find that there is no discoloration of the amalgam between the wall of the tooth and the filling proper. As we all know, oxyphosphate cement, properly mixed, sticks to the walls of a cavity very nicely, and by packing the amalgam right in with it while it is soft we make a union of the two materials, and the shrinkage, if any, is outside, where it does no harm. I have also used the same method for gold fillings. Having the cavity properly prepared, I mix a little oxyphosphate cement and cover all the walls of the cavity with it; then pack gold into the cavity, bringing it nicely into the undercuts, being careful to prevent the cement from touching the upper surface of the gold. By the time I have that well condensed the oxyphosphate has become perfectly hard, and I take a fine bur and trim the edges perfectly clear, so that none of the oxyphosphate is exposed; then go on and finish the filling. I have had great pleasure and satisfaction with fillings made in this manner. Dr. Atkinson saw a cuspid tooth which had been abscessed and very much discolored, but which when filled in this way showed no discoloration. I believe that we can make air-tight fillings by this method; and I am sure it will save us a great deal of tedious work in making retaining-points. Of course, by the Herbst method we do not need to do that either. Another advantage is this: If there are little places in a cavity which we cannot easily reach to condense the gold as it should be, I think the oxyphosphate will fill those little points. In cases of sensitive teeth, we save our patient a great deal of pain and ourselves a great deal of labor. There is also a considerable saving of gold. I should like to have some of the gentlemen present try this method. I think you will find it is an excellent one. One tooth, which it had been a puzzle to me and to several other dentists to fill with any material, I have filled by this method with a great deal of success.

About four weeks ago a lady was sent to my house, through knowl-

edge of my having removed a tumor from a gentleman's mouth by ligatures, in the case I reported to you last May. This lady is suffering from a tumor situated on the left breast, and about the size of a large goose-egg flattened. At one point it has a cancerous character or appearance. My object is to raise it away from the breast before severing its attachments, for which purpose I have made a fixture which is strapped around the back and is made to fit accurately at all points, being formed like a crown. When power is applied to draw the fixture back, it brings the tumor forward. I began treatment about the 27th of August. You have no idea how the tumor is creeping out from the breast through the fixture. After I shall have raised it away from the breast I intend to break its attachments by ligatures. I have succeeded wonderfully. There is much less pain than there was before I began treatment.

Dr. C. S. W. Baldwin. The method of lining cavities with oxyphosphate which Dr. Reese has described is a very good one. I tried it some five or six years ago. It was introduced and spoken of by Dr. T. B. Welch before he went into the dental manufacturing business. I saw him exhibit that principle as he was introducing his oxyphosphate of zinc. He said he had tried it repeatedly. He went so far as to believe that he could plate the outside of an oxyphosphate filling with gold, inserting the gold while the oxyphosphate was soft, and making a thin plate on the outside, thereby saving himself a great deal of work and considerable gold, and saving the patient much time and annoyance. I tried all of those experiments; and I found, as I believe most of you will find, that there is nothing quite so good to hold gold fillings as good, solid tooth-material itself.

The Chairman. Gentlemen, we will now proceed to the paper of the evening, by Dr. William H. Atkinson, M.D., D.D.S., upon the

Evolution of Preserving Teeth by Filling—Materials and Methods.

As evolution in the great sense must be a secondary process of serial reversion of "involution," in accordance with the plan of all structures, it will readily be seen that imperfection of build according to type lays the foundation for the necessity of redemption and preservation. This is preëminently so in the case of unsound teeth. It will hardly be necessary to state here that which is involved in the first sentence, viz., that perfect structures do not decay prematurely in whole or in part. The loss of teeth by decay first induced men to seek means of arrest of the decay and restoration of the lost parts. The recorded history of the attempts to accomplish this de-

sirable purpose is involved in such ambiguity and contradiction as to materials and methods resorted to, that it is deemed unwise even to attempt a synopsis of the incongruous jumble. History is but the record of the observations and interpretations of individuals at best; therefore allow me to detail in simple narration the observations of one individual.

The first time that the subject was brought to my attention, when I was less than ten years old, was the practice resorted to by my eldest brother and a companion of his, in the wilds of the then new settlement in Mercer County, Pennsylvania, who bit slugs of lead into the cavities of decay in their molars to prevent the tough, wild meats and coarse foods from annoying them in eating. With this incipient effort they found so much advantage that they cast about for something more plastic with which to stop the irregular cavities, and they used resinous gums of pine and hemlock to saturate, by heat, small sticks of tough woods—oak, hickory, or pine—which they drove into the cavities and cut off with their pocket-knives, being careful to place a portion of the gum into the cavity before driving the stick. The next step was the advent of a Methodist minister who carried a small pocket-case of scalers, with which he cleaned the teeth of our family of the accumulations about their necks, and gave us instructions how to keep them clean. Subsequently setting pivot-teeth of porcelain on roots and filling cavities with amalgam were brought to notice by a man calling himself a dentist.

It is fair to presume that an aggregation of experiences, each beginning *de novo*, introduced in various localities various methods and modes of accomplishing the desirable object of arresting decay in teeth by filling. In the second or third year of my attempt to study medicine I was induced to take a course of instruction in excising decayed crowns and setting pivot-teeth upon their roots with hickory-wood pivots, and filling cavities with amalgam and tin, by some recipe regarded as precious. Among the recipes was one for making Crawcour amalgam. Not being able to purchase such instruments as the dentist had for excavating and filling, I noted them particularly as to form and variety, and when he had gone I bought Allerton's shoemakers' awls, from which were constructed excavators and pluggers (as we then called them), which I fitted to socket handles made for me by a gunsmith. These were of but two shapes, round and flat-pointed, bent at various angles, according to fancy. The flat points were sometimes slightly nicked with a file; the round points globular or flat on the end. With these I worked for years, making additions from time to time until I could procure better ones in the market. For finishing fillings I used such files as I could procure.

With no better preparation than here indicated, I was able to obtain commendation from ministers, doctors, and lawyers, with whose recommendations as a competent and reliable dentist I went from place to place and offered my services to the people, with an acceptance that is more of a marvel to me now than it was then, and I have since seen many teeth then filled that remained in place for years, some of them over forty. The early teachers in dentistry of the East, who made dentists by the short method of recipes and secret oral instructions, when asked by pupils, "How do you fill teeth?" replied, "That you must find out as I did—by practice." A broken excavator accidentally picked up and used as a filler packed the gold so well as to suggest the use of serrated ends for pluggers. This was followed by deep serrations of coarse teeth, which were modified from time to time to finer and finer teeth, until at last perfectly smooth points came again into use in my practice. Instruments follow the order of evolution which the involution of necessity demands, and are at first dimly foreshadowed by revelations to the geniuses who are said to invent them. They are discoveries rather than inventions. As will be seen, the first instruments I used were copies of those shown to me by my instructor. The difference between the knowledge of instructors, then, is the difference between partial and full text of instructors' lay-out or classification of means and ends sought to be brought about. The dim, shadowy suggestions of inspirational necessities are but the thin outline of the means to the true order of fulfilling the necessary demands, when they shall have been materialized in accordance with the exact type of the shadow presented to our perception. This is difficult for the novice to do by reason of the diversion of his untrained attention from previous perceptions as to the limitations of possibilities in psychics and mechanics; hence "inventors" who follow their inspirations are "cranks" in the estimation of all who assume a knowledge they cannot prove themselves to be possessed of.

Such is the strength of "habit," that we cling to that already formulated, even upon doubtful premise, rather than open ourselves freely to the new impulse. In saying this I speak out my own inmost experience, as exemplified in the case of the broken excavator, which gave the ideal perfection of serrated end for impacting gold. It took years to free me from the dictum of partial knowledge of the principles involved in correct practices of filling teeth. Outside interferences, with obedience to our inspirations, which would bring rapid, safe, and sure progress in the right line of development, are chiefly chargeable with the deflections we make and the slow releasing of hold upon embryonic conditions of mind, body, and practice which we are thus led to pursue. The order of evolution from round,

flat, triangular, and square to ovoid points of instruments need not have taken so many years to complete could we only have been free from the assumption that each step was the end of progress towards perfection. The set of fillers known as "Omegas," and called by my name, do not quite perfect the ideal from which they sprang. The reason for this is complicated and more honorable than appears without historical detail of how the set was made. The plan of the type for fillers given me was that of an egg, modifications of which present segments of a sphere from the point to the triangle, square, and wedge, by slicing away the sides to produce the desired shapes. The impacting face may be quite smooth, slightly roughened, or serrated finely or coarsely with shallow or deep cuts, and yet not depart from the ideal of direct packing of the gold ahead of the instrument. Whether we are nearing the end of improvement in filling teeth or not, we are at least progressing in the order of the inspirational necessities from early practices through varied experiences of means and methods down to the summation of these in the Herbst method, by using the hand impact and rotation of point in combination, thus securing adaptation of filling to wall of cavity heretofore unattained by any method. The hand may rotate the unpolished end of the filler and effect the work in good shape; but the rotation of the point in the hand-piece of the engine saves time and secures superiority of adaptation, besides being less unpleasant to the patient. In fact, in Herbst's own hand the pressure of packing the gold was rather pleasurable than otherwise in my own mouth. A glance at what has already been said will reveal the sum of a long and varied trial of means and methods resorted to in attempts to save decayed teeth by filling. No single, partial presentment of method can compare with a combination of all the good points in the different methods conjoined in successive adaptation, which I regard the Herbst method as presenting.

Discussion.

Dr. G. A. Mills. Hearing Dr. Atkinson relate some of his remarkable experiences carried me back to my own early observations. With us, as in Methodist meetings, personal experiences often prove to be the most valuable and interesting topic. Dr. Atkinson spoke of his first observations and efforts in connection with dentistry, which, of course,—strike you as being very crude indeed. My own were of a similar character, and, like his, illustrate the fact that the ideas and methods of men originate in their own necessities. My early experience, as with many of us, goes back to the time when my temporary teeth were extracted with a turnkey, around

which was tied a red silk handkerchief. The men who practiced dentistry in that way at that time were physicians.

The first operation I made in dentistry was in my own mouth when I was about thirteen years of age, and was a result of what we call an unfortunate accident,—the falling down upon the ice and breaking of my upper central incisors. The pulps were left exposed. In the town where I was living there was a gentleman who was half physician and half dentist, being the only dentist of any kind in the neighborhood at that time. After twenty-four hours' suffering I was induced to go to this gentleman and have these pulps, which were hanging down, removed by the operation of probing them out, as they called it. Not long after that, being in school and my teeth broken off, I conceived the idea of supplying their loss, more in a spirit of mischief than anything else; and during school-hours I set to work and carved out some wooden teeth and put them into the sockets formed by the pulp-canals. I purposely placed them in irregularly, one standing in and the other standing out, so that they would look more grotesque and ridiculous. That circumstance of losing my teeth and that crude effort to replace them were the direct cause of my becoming a dentist. When I commenced the study of dentistry, in the city of Worcester, in the year 1853, I was very fortunate in having for my tutor a gentleman of sufficient liberality at that time to give me a privilege that was not often accorded in those days. He brought me directly to the operating chair, but almost invariably, with a sort of half apology, he would request the patient to indulge him in the privilege of bringing me to the chair as an assistant. I recollect going to the chair many a time, ostensibly for the purpose of holding some instrument or a napkin, but really for the purpose of giving me an opportunity to witness his operations. He thought the patients would object if they knew I was there as a student, which was the prevailing prejudice at that time. As Dr. Atkinson has said, practitioners would take a fee for educating a man as a dentist, and would send him out with a certificate of qualification, when he had never seen a tooth filled in his life. I speak of this state of things for the purpose of contrasting it with the great facilities for learning which we enjoy at the present time. I would like to see many young men who are entering the dental profession to-day undertake to fill teeth as I did and as others did thirty or forty years ago; and if I were a teacher of dentistry in the schools I should insist upon a great many things being done in the direction I followed, and particularly hand training in filling, for the reason that it would give students a familiarity with the use of instruments and a manipulative ability which to-day is almost ignored in the schools, because our methods of filling teeth have become so different.

I have in my office to-day the first instruments that I ever used in filling teeth. They were made by myself, and have wedge-shaped points, bent at an obtuse angle. The method of filling with gold which I learned was to take a ribbon of foil and place it in the cavity and crowd it down to the bottom, and then, by a system of interlapping and folding the ribbons, carry the gold into its place sufficient to fill the cavity, leaving a certain amount projecting from it, which was condensed afterwards to make the form and contour of the tooth. The last ribbons forced in with the wedge-shaped instrument confined the whole mass. It would sometimes happen that in making a filling a ribbon would get displaced, and we would get hold of one end of it and pull it out in one unbroken piece. A great many excellent operators in those days made their gold fillings exclusively in that way.

I speak of this simply to show how we have changed our methods and our appliances. If our young men of to-day were to see the few and simple instruments which were all we had to work with at that time, they would wonder how we ever got along. It is a marvel indeed that we attained the success we did, when we consider how few facilities we had for overcoming the difficulties that necessarily come up in filling teeth. With all our familiarity with dental matters now, if we should be stripped of our modern appliances and carried back to the crude methods and instruments of those early days, we would find it very difficult to get along. I do not think we realized how much was done for us in those early times, and it is pretty certain that we do not now. And this leads to the fact, which is becoming very noticeable, that a great many ideas have been original with many different persons. We are so ambitious for originality that we are apt to claim too much. If this question of originality should be reduced to the actual facts, many of us would find ourselves shorn of a good deal of the glory we claim. Necessity is the mother of invention, and many of the valuable devices that we enjoy to-day have been conceived in a moment of necessity.

There has been a great deal said lately in the journals to the effect that certain men originated what is now known as the Herbst method, and knew all about it and used it forty years ago. There are a great many bright men who are foolish enough to make statements like that.

Dr. Atkinson brought out the idea of round-pointed instruments. Many of the old practitioners, some of whom I see before me, have a definite recollection of these round-faced pluggers being used in the early days of the profession ; but it is a question whether, when they used that class of instruments, they knew really what they were doing with them. They used them as copyists, without know-

ing why they did it. Nine-tenths of the dentists are copyists anyhow. Few have genius enough to originate ideas,—but there are a few. The first time I went into the office of Dr. Riggs he showed me some instruments which he had had ever since he was in practice. He practiced in Hartford over fifty years. The instruments were blunt, and shaped on the end almost like half a sphere. He was very thorough in his work, and thoroughly old-fashioned. He held his instrument in such a way as to enable him to give a twisted or rotary motion, equivalent to the rubbing motion that we use to-day. There are other men who have been using instruments in the same way for years. There are men in this city who have been using the same principle in filling teeth, in a limited way, that Herbst has brought out. They did what our grandfathers did when they rode from Boston to New York on horseback with a woman behind on a pillion—they got there; but to-day we come in a Pullman car. That is the difference. We have been making steps in this direction and have managed to get along slowly, but we have to-day something like the Pullman car in the Herbst method, which is the personification of simplicity and perfection. I cannot conceive of a more admirable method of filling teeth than that demonstrated by Dr. Herbst. That every man who tries it will do as well as Dr. Herbst I do not pretend to say, but I think we shall have some who will excel him. We will have our Webbs, our Varneys, our Williamses, and other men of large ideality, who will excel Dr. Herbst in using his method. It will be perfected to a greater degree than Herbst has perfected it; and for this reason, that our atmosphere is more favorable than that in which Herbst has worked. Put Herbst in our atmosphere and he would develop far more than he has been able to do in a less favored environment.

We can perfect our ideas and methods by association, and we get an inspiration to develop them which men working almost alone and in obscurity cannot be expected to have. My opinion is that in the time to come our practice will run largely in the line that Herbst has taken. There are some men who will insist upon filling with a needle-point, and who make comparatively successful work of it; but in simplicity and in conformity with scientific principles I think the Herbst method is *par excellence* above any other that we have, and that it will prove to be so perfect that it will be the *ne plus ultra* of the art of filling teeth.

I am reminded of a prediction that was made by the late Dr. S. S. White, on the street in the city of Hartford one day, when our conversation was upon the subject of the convex smooth fillers which I had brought out. He said, " Dr. Mills, I predict that the time will soon come when the use of round-faced instruments as fillers will be univer-

sal." He foresaw what was coming, and that in the evolution of instruments that would be the prevailing principle. The beginning of the verification of that prediction is seen in the introduction of the Herbst method. I believe sincerely that the practical men of this country will rise to the situation and see the value of the Herbst method and be ready to adopt it. They have given him a very handsome send-off, and have sent him home a very happy man.

I have attempted to fill teeth on this principle heretofore, but did not succeed very well. The idea was crude in my mind. I condensed gold in that way as far back as 1862. The first place where I saw it done was in Dr. Atkinson's office. We used to take Watts's gold and fold it in several thicknesses into a mat and lay it on the surface of the filling and rub it on, making a face or finish to the filling in that way. That was the same principle that Herbst has taken up. Later I used a corrugated burnisher, and I have repeatedly, for the same purpose, put pieces of gold upon a filling and rubbed them on with a corrugated burnisher in the engine. I have rubbed on 120 gold and made a good surface with it. But I did not catch the idea as far as Dr. Herbst has done. Dr. Pack, in undertaking to show the cohesive character of his gold, would, after packing some in the handle of a tooth-brush, take an instrument and lay a piece of gold on and rub it over and condense the ribbon upon that surface, upon exactly the same principle of the Herbst method, only it was a different application of it.

It has been said that this principle of uniting gold under a burnisher was unphilosophical, and that it could not be done. One very good man whom I see here to-night made a remark to that effect to me some years ago; yet I was doing it right along, and Herbst has shown that it can be done.

Dr. Bōdecker. Mr. President and gentlemen, I will not take up much of your time to go back to the early times of dentistry. However, a few remarks of that kind may be in place. My first preceptor in Germany was a dentist and jeweler. He was a very old man. In Germany, especially, patients dislike very much to be seen by anybody even in the hall of a dentist; therefore in the house of my preceptor there were several operating rooms, and each communicated with a separate hall and had a separate door for egress, so that any patient going out from the house would not be seen. They came in all in common where the other people came into the house, but they went out at different doors and into a different street, so as not to be observed. At that time this gentleman made artificial dentures of gold upon which were mounted natural teeth, and in some instances we carved them out of hippopotamus teeth, and then attached natural teeth to them. In these days it is a great rarity to

find a specimen of such work. I had the fortune to be admitted into his operating room only once, and that was when a relation of his was to have a tooth filled with tin. The instruments which this gentleman possessed for filling teeth consisted of one hook, one so-called excavator, and one round-pointed instrument with which he inserted the filling-material. He never filled any tooth that had ached, nor any large cavities. He only attempted to fill approximal cavities of the front teeth, where he could easily get at them; although he knew how to separate the teeth by wedges just as well as we do to-day; not with wood, but wedges made of silver or gold. In this way he obtained access to the cavities; but his fillings, as I think of them now, were very crude indeed.

In view of these facts I can but congratulate the dental profession as it stands at the present time, especially in this country. Its development has been, as you know, very great since those days. It does not stand in the same position in Europe now as it did then, but the progress there is not very rapid.

I will call attention here to a letter which has been published in the DENTAL COSMOS, and which seems to intimate that Dr. Herbst had copied all of his inventions from the Americans. Gentlemen, I assure you that Dr. Herbst, in the first place, does not understand the English language; and he seldom goes to society meetings in Germany, and when he does they speak very little of American inventions, for the reason that they do not know anything about them; and those gentlemen that do know something about them,—mostly those who have been over here and have obtained their education in this country,—until within a few years, have kept away from societies. Up to about eight or ten years ago every dental practitioner in Europe kept his operations secret. No dentist was allowed inside of another's operating-room, and, as Dr. Herbst announced, when here, when he graduated from the college in Rostock he had learned everything else except the art of filling teeth, and yet he graduated with the highest honors. When he commenced his practice in Bremen he was too proud to go to another dentist and ask for information, and he knew very well that if he had gone he would have told him very little about it. The way Dr. Herbst's inventions came was principally through his own needs. He felt the need of them; and, if he had not been as great a genius as he is, certainly he would never have accomplished what he has. Three years ago, when I was in Europe, I was amused a great many times when he showed me new inventions which he had produced. He would say, "Is not that a beautiful thing? Just look at it!" When I replied, "Yes, it is; but we have had that in America long ago," it surprised Dr. Herbst very much. Three years ago, when he told me about his

steel-pen invention for holding the rubber dam, I told him we had clamps for that purpose; and he replied, "How foolish I was to trouble myself about it! That thing did not let me sleep for more than a week. I had a very bad case of a cervical cavity which I could not fill; I tried to tie the rubber dam in place, and could not; I tried to hold it, but could not hold it long enough; then I got somebody else to hold it, and they could not hold it either. I saw no other way; I did not know of any clamp, and so I invented this steel pen." And, gentlemen, his other inventions were brought out under similar circumstances. But this does not make any material difference. Dr. Herbst is not a man who cares much for them. He remarked, "You say this thing has been done in this country fifty years ago? All right; so much the better; but why didn't you practice it? The only reason why I came to this country, or thought it would be worth while to come to this country, is that I think this method saves the patient as well as the operator a great deal of time and pain, and at the same time we can obtain an adaptation of gold to the walls of the cavity which is (to quote his words of two years ago) 'as good as it can be made with the mallet.'" But we now know that it is much better. Speaking of the Herbst method a little further, I would say right here to those gentlemen who are going to experiment with it, do not make one or two experiments and then conclude, if the fillings do not turn out as well as you would like, that it is of no value. I do not believe that anybody can use this method satisfactorily at first. It is not difficult to comprehend, especially if it has been shown to you out of the mouth. Anyone will comprehend it quicker in that way than by seeing an operation done in the mouth. Try it several times; and when you first attempt to practice it in the mouth I would certainly advise you not to adjust the last layers of gold with the Herbst method. Finish the fillings with the mallet until you have become better acquainted with the working of the gold in this manner, and then you might do it as perfectly as Herbst does it. As Dr. Mills has said, I have no doubt whatever that in a few years we shall have hosts of operators who will make more beautiful operations than Herbst has done by that method, because he has not had the training and has not had the opportunities for making progress that we have in this country.

In this connection I would say that at every clinic from the next one I shall endeavor to operate myself, and I have some promises from other operators who will fill teeth at the clinics by the Herbst method. I will at every clinic, if possible, fill some teeth out of the mouth, set in plaster. I think in that way the principles of the method will be more easily comprehended than by seeing teeth filled in the mouth. I would also announce that at the next clinic I shall try to

have a trial of several different kinds of plastic gold which have lately attracted a great deal of attention in the dental profession. There may be something in it. We do not want to discard a good thing; neither do we want to mislead, or have anybody misled. I think this material ought to be brought before the clinic under competent hands, and therefore I have asked Dr. Wm. H. Dwinelle to be present at the next clinic to watch the operations and experiments with the different kinds of plastic gold. I have obtained some of the German plastic gold, which will be tried there at the same time with the other plastics which have been used in this country. Such a plastic gold, if found worthy, may be used in connection with the Herbst method; and, gentlemen, if that rotary method should turn out to be of no other value than for lining cavities, we can fill the rest with plastic gold or something else. I therefore think it is worth while for any practitioner to try it and experiment with it.

Dr. Reese spoke of the practice of lining cavities with oxyphosphate. I tried that some years ago, but I did not pursue it any further. I have not tried it with gold, but I tried it with amalgam. I do not know whether I was sufficiently careful to avoid the cement coming up near the enamel edge; but I have found that in a great many cases secondary decay occurred near the edge. But at that time I used oxychloride of zinc. I do not know whether it was the fault of the cement or the amalgam. At that time I used Arrington's amalgam, which I have since entirely discarded. Of late I have been lining cavities with gold upon the same principle as Dr. Herbst has shown at the clinics,—viz., in the following manner: I take a large cylinder of gold, loosely compress it between the fingers, and dip it into a very thin solution of gum copal,—a couple of grains of copal to half an ounce of ether; then squeeze out the superfluous liquid, and after waiting a minute until the ether has evaporated, I hold this before the cavity and with a piece of cotton upon an instrument push the gold into position and condense it against the wall with a rotary burnisher in the engine. This will adapt the gold to the walls beautifully, especially against the labial walls of incisors and bicuspids, and give a life-like appearance to the teeth which cannot be obtained with any other material. Even if you fill incisors with oxyphosphate, by lining them with gold in this manner you get a beautiful, life-like appearance, which will please your patients as well as yourself.

The liquid varnish which is used is applied not so much for the purpose of making the gold stick against the walls of the teeth; but in cases where you want to fill them with amalgam, by applying this thin copal varnish it will prevent it from being attacked by the mercury in the amalgam, and thus prevent discoloration.

Dr. Herbst said he had been experimenting with amalgam quite extensively. He said, "Mercury is never the cause of discoloration nor of shrinkage." He showed me one specimen which he said was filled by pouring the amalgam in; that it contained twice as much mercury as amalgam, and yet it was perfectly hard and the discoloration no more than in other cases which had equal parts of mercury and amalgam. He came to the conclusion that the more silver there is in an amalgam the more discoloration and shrinkage there will be. That is in accordance with what we know of the old amalgams, which were made of silver and tin; the more silver the more discoloration. As soon as I can find time I shall experiment with amalgam, and in due time present the results to the society.

Dr. W. H. Atkinson. I want to compliment Dr. Bödecker on his straightforward, clean-cut remarks in vindication of Dr. Herbst's honesty of purpose, that I am impressed with so deeply since I have been with him. Although I cannot speak German, I can feel truth. I could feel righteousness in the man's touch and movements, and I believe that every man who saw Herbst perceived that he was a genius all through, and that he was radiant with the work he had in hand. He took hold of it as if he had it in his heart to do good, *con amore*, as the old Latins would say.

The way to teach is to try to bring the pupil into the same point of observation that the teacher stands in. When I get the truth I want my fellows to have it. When I am converted to the truth I want my fellows to be converted too. I want you to have religion in your practice. I want you to have righteousness and honesty of purpose to do with your whole might what you have to do; and when you get a thing which you have some suspicion is better than what you had before, do as Dr. Bödecker is doing in giving the profession the results of his study cost free the first time. He gave you good advice in relation to your first attempts to fill by the Herbst method. I filled a tooth yesterday, and as I had had exactly the same experience that Dr. Bödecker has described, when I got the walls completely lined and the cavity mostly filled I went back to the old mallet to finish the filling with; and I shall do that until I get sufficient manipulative ability to pack gold over the edges of a cavity in the beautiful way in which we have seen Herbst do it. He learned to use his hands in the jeweler's shop. I noticed that in pressing upon a tooth with his thumb he always pushed in the line of the greatest resistance of the tooth-substance and in the direction of the tooth-socket, so that the motion of the instrument would not shake it. He was the very exemplar of excellence of touch. We want that kind of touch more than we do any preachments of repentance after the evil is done.

Dr. W. G. A. Bonwill. I would like to ask one question of Dr. Bödecker. Why is it that Dr. Herbst has to use so much hand-pressure before he uses his rotary movement?

Dr. Bödecker. It is not to condense the gold by means of hand-pressure so much as it is to pack it down so that the rotary burnisher will carry it to places where you want it. If you put some cylinders into a cavity, as he did several years ago, and as I did it myself, the gold will be whirled around in the cavity, and ten chances to one you get it where you do not want it; so that his hand-pressure dentistry came into use to bring the gold to the point where he wants it, and where it was then condensed by the rotary motion.

Dr. Bonwill. It struck me that one-half the time was consumed in packing by hand.

Dr. Bödecker. Yes.

Dr. Bonwill. What is the object of machinery in dentistry if it is not to avoid as much as possible all manipulative work,—all of that kind of work which was done heretofore by the hand-mallet, or the automatic mallet, so-called, which causes so much exhaustion of nervous force? It seems to me that the adoption of machinery was for the purpose of obviating that. That is the reason why I adopted very early the method of filling with the electric mallet. It saves time, labor, and the patient. In looking at Dr. Herbst in the many operations which he performed in New York, Philadelphia, Asbury Park, and Niagara, it struck me that if you analyze the action of the electric or mechanical mallet in the hands of a man who understands how to use them, you get precisely the same thing as Dr. Herbst without any hand-pressure. If I had to go back to *any* hand-pressure, which Dr. Herbst did in at least one-half of his work, I should feel that I was going backwards in dentistry. I can commence a filling from a single point, and, without any hand-pressure whatever, impact as much gold into a cavity by either the electric or the mechanical mallet as it is possible to get into a cavity, and place it as perfectly against the walls as it is possible to do by any instrument, and I will do it in one-half the time in which it can be done by the Herbst method or by any other, and by a rubbing blow.

In looking at the time required by Dr. Herbst, as given in the last *Dental Practitioner*, I found that in the most rapid movement the amount of gold foil consumed would be one grain to the minute, and that in a matrix out of the mouth.

Dr. Bödecker. It has never been so.

Dr. Bonwill. From the figures given, I calculated that it would be about a grain to the minute. I know that I can, one hour after another, pack in at least one and a half grains a minute, or nearly two grains a minute if I use heavier gold; and any one can learn

to do the same thing. I do not see the necessity of consuming more time than from forty-five to fifty minutes in packing one book of foil.

Then take into consideration the little labor that is required to pack it in. It is as painless to the patient as any other method, and will save a great deal more time with the majority of men. That is my experience. I use no matrices. I have no use for those things. I think Dr. Herbst will come to the same conclusion when he goes home. He can learn to pack gold faster and better with the mallet than he can possibly do it with the rotary burnisher, and a great deal easier to himself and with just as much comfort to his patient,—with more comfort, take it altogether. That is what I think. It will make a vast difference when he comes to prepare his cavities differently. I do not think he will use his method to the same extent.

Dr. Bödecker. Mr. President, if I may be allowed to say a few words more in explanation, especially of this point, Dr. Herbst on several occasions said to me, and stated I believe at one of the meetings very plainly, after seeing the rapid way in which Dr. Bonwill packed gold into cavities of teeth, "If I had been able to pack gold only the one-hundredth part as well as Dr. Bonwill does before I commenced my method I would never have attempted to do it in the rotary way. I had a mallet, but I did not know how to use it. I had nobody to teach me how to insert a filling with a mallet or with hand-pressure, or in any other way; I was there in the woods all by myself, and I had to invent a method." But a gentleman who has been going on in this way for nearly eight years is hard to convince that he should throw away the method by which he has got along well and take up the mallet, an instrument which certainly to him would be a thousand times more difficult.

Dr. Bonwill calls your attention to the average time consumed in packing gold by the rotary process; and he is correct; but if you pack it in the way which I have advised, you save a great deal of time, and Dr. Bonwill will agree with me in this. In the first two-thirds of the operation Dr. Herbst can introduce gold twice as fast as you can do it with the mallet, but the last third of the operation takes more time than is required with the mallet. Even in Herbst's hands the last layers take the most time. And it is just for that reason that I advise the use of the mallet for those layers. I have used the electric mallet and the Bonwill mallet for many years. I can work with them quite fast, but not by any means as fast as Dr. Bonwill. In the first part of the operation, I can assure you, gentlemen, that you will save more than one-half or two-thirds of the time if you will begin to fill your cavities by the Herbst method.

It is only in the last layers where you need to use so much hand-pressure to tack it down where you want it before using the rotary burnisher in the engine. In putting on the last layer Dr. Bonwill is right in saying the Herbst method consumes more time than is required with the mallet.

Dr. Bonwill. I made the assertion some time ago, at a meeting at Asbury Park, that I could pack Abbey's old-fashioned non-cohesive foil as perfectly and as easily with my mallet as I could any adhesive foil, and make it weld as perfectly. I gave to Dr. Herbst, who ran out of gold at the time, a piece of Abbey's No. 30 old-fashioned foil, and he seemed to pack that on with as much velocity and ease and comfort as he did the Wolrab gold. The packing on as he did of that old-fashioned foil convinced me more fully of the point I had taken in regard to the packing of Abbey's old-fashioned foil with my mallet. That is a very important thing; for it was not known, and was not even believed after I had asserted it. You can pack Abbey's foil with the mechanical mallet more perfectly against the walls of the cavity, and afterwards add adhesive gold, than you can do it by any other method.

The introduction of the electric mallet was the first successful attempt to perform the work of filling by a power extraneous to the human body. Up to that time, in the operation of filling teeth with the mallet, you could only give an individual blow, and that blow was given upon an individual spot. You could not move the instrument across the surface at the time the blow was struck; there must be an individual blow, and only one at a time. But with the electric or mechanical mallet you got three to six thousand blows to the minute; and every one of those blows is a perfect packing blow. Instead of putting the instrument down you could move it across the surface, and in the same amount of time it would take for one blow alone you could do four times the amount of work.

If my electric and mechanical mallets have been unpleasant to patients at times, it was where the operators did not understand that point. Four blows are given before you can take the instrument up and move it to another place, and you get more blows upon one point that do not do any good. By moving the instrument over the surface of the gold constantly, the work of condensing is done with great rapidity and with less discomfort to the patient. You have wondered to see me operate so rapidly, and it has been said that a man cannot work so rapidly and do the work well. But I am of a nervous temperament, and I claim that if one understands enough of mechanical principles to produce the instruments I have he certainly should be able to use them and to fill teeth with facility. While I do fill teeth rapidly, at the same time

I do it well; and the rapidity of my operating is not due so much to my nervous temperament and mechanical turn as it is to the sliding movement of the instrument that I adopt. If you get into the habit of waving it across the surface you give a different sensation to the patient, and also save two-thirds of the time that would be otherwise consumed. I can pack in day by day a book of foil in forty-five minutes. I do not want to work any faster than that; and I know I please my patients, or I would not have so many. Knowing what I do of mechanical principles, I am perfectly satisfied to ask this question to-night. Do you suppose I could do any better with the method of Dr. Herbst than I am doing, or produce better operations than I can by the method I am already using?

Dr. Bödecker. Gentlemen, I think the perfect adaptation of gold to the walls of cavities that is obtained by the rotary movement cannot be obtained, at least from a microscopical stand-point, by any mallet that I have ever tried. Dr. E. Parmly Brown, as you know, put in a filling at one of the clinics with the greatest care with the mallet, and took more than double the time in packing the same amount of gold that was required by the rotary movement; and yet the plug was quite imperfect in regard to the adaptation of the gold to the walls of the cavity.

Dr. Bonwill. The question is, whether you would advise me to abandon the mechanical mallet. If we can do good work in that way, is it not better for those men who have spent a lifetime in coming up to that point to stick to the method they have learned? It is a hard task, after a man has gone through a course of study and practice to reach a certain point, and after he has arrived at the age of fifty years and feels that he is just beginning to do his duty properly, for him to abandon his methods and pick up something else by which he may possibly do better. Had he not better stick to what he has learned with so much labor rather than throw it aside and take up something that he "knows not of?"

Dr. Bödecker. Mr. President and gentlemen, I can only say, as I have said before, that as the adaptation of the gold by this method proves to be better than the adaptation attained by any malleting process, and as, in my judgment, the perfect adaptation of the gold against the walls and edges of the cavity is exactly what saves a tooth, I would therefore practice the Herbst method if it were only as far as lining the cavities with it, making the rest of the filling with the mallet, if you please. I use your mallet, Dr. Bonwill, to-day for finishing, but the first layers of gold I should certainly prefer to be inserted by the Herbst process.

Dr. Bonwill. Taking all things into consideration, I do not think I would like to give up my method, which I am mastering more and

more all the time. I feel that I am doing better operations than I ever did before in my life. I cannot decide yet until I try Dr. Herbst's method thoroughly. If he will do with my method and instruments what I shall do with his, I think he will find that he can save an amount of labor that "he never dreamed of in his philosophy."

Adjourned. B. C. NASH, D.D.S., *Secretary.*

CONNECTICUT VALLEY DENTAL SOCIETY.

AT the annual meeting of the Connecticut Valley Dental Society, held in Holyoke, Mass., October 14 and 15, the following officers were elected for the ensuing year:

E. A. Stebbins, president; J. N. Davenport and F. W. Williams, vice-presidents; George A. Maxfield, secretary; A. J. Nims, assistant secretary; W. H. Jones, treasurer.

The next semi-annual meeting will be held in Montreal in June, 1887, and a general invitation is extended to members of the profession to attend. Special arrangements will be made with railroads and hotels, and further notice will be given as early as next April.

GEO. A. MAXFIELD, D.D.S., *Secretary*, Holyoke, Mass.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA.

THE Odontological Society of Western Pennsylvania will hold its next regular quarterly meeting on Tuesday, December 14, 1886, at the office of Drs. Libbey, corner of Sixth avenue and Smithfield street, Pittsburg, Pa. C. V. KRATZER, *Secretary*, Braddock, Pa.

MASSACHUSETTS DENTAL SOCIETY.

THE twenty-second annual meeting of the Massachusetts Dental Society will be held in the Y. M. C. A. Building, corner Berkeley and Boylston streets, Boston, Mass., on Thursday and Friday, December 9 and 10, 1886, commencing at 11 o'clock Thursday morning. G. F. EAMES, *Secretary pro tem.*,
62 Trinity Terrace, Boston, Mass.

EDITORIAL.

DENTAL LAW OF BRITISH COLUMBIA.

WE present herewith the full text of the act to regulate the practice of dentistry in the Province of British Columbia, which has become a law:

WHEREAS, The profession of dentistry is extensively practiced in Europe, the United States, and the Dominion of Canada; and whereas, the said profession of

dentistry is protected by law in Europe, the greater portion of the United States, and in parts of Canada; and whereas, it is expedient for the protection of the public that there should, by enactment, be established a certain standard of qualification required of each practitioner of the said profession or calling, and that certain privileges and protection should be afforded to such practitioners:

Therefore, Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of British Columbia, enacts as follows:

1. That it shall be unlawful for any person to practice or attempt to practice the profession of dentistry or dental surgery in the Province of British Columbia without having first received a diploma from the faculty of some reputable dental college, school, or university department duly authorized by the laws of Great Britain and its dependencies, or the laws of some foreign government, and in which college, school, or university department there was at the time of issuance of such diploma annually delivered a full course of lectures and instructions in dentistry or dental surgery, and without having had issued to him a certificate under the provisions of this act: Provided, that nothing in section 1 of this act shall apply to persons who have been three months in actual practice in this Province previous to the passage of this act, except as hereinafter provided, and nothing in this act shall be so construed as to prevent physicians, surgeons, or others from extracting teeth.

2. A Board of Examiners consisting of three practicing dentists, residents of this Province, is hereby created, who shall issue certificates to persons in the practice of dentistry or dental surgery in this Province, who have been three months in actual practice in said Province previous to the passage of this act; and also to decide upon the validity and sufficiency of character of such diplomas as may be subsequently presented for registration as hereinafter provided.

3. The members of said Board of Examiners shall be appointed by the Lieutenant-Governor in Council upon the passage of this act, and shall serve for a term of three years, excepting that the members of the board first appointed shall hold their offices as follows:—One for three years; one for two years; one for one year respectively, and until their successors are duly appointed.

In case of any vacancy occurring in said board such vacancy shall be filled by the Lieutenant-Governor in Council from those in actual practice in the said Province.

4. The said Board of Examiners shall keep a record in which shall be registered the names, residences, or places of business of all persons authorized under this act to practice dentistry in this Province. The said board shall elect from its members a president and a secretary, and shall meet at least once a year, and whenever applications for certificates shall be made. A majority of the members of said board shall constitute a quorum.

5. Every person engaged in the practice of dentistry within this Province at the time of the passage of this act shall, within three months thereafter, cause his name and residence and place of business to be registered with the said Board of Examiners, upon which said board shall issue to such person a certificate duly signed by a majority of the members of said board, and which certificate shall entitle the person to whom it is issued to all the rights and privileges set forth in this act.

6. To provide for the proper enforcement of this act, the said Board of Examiners shall be entitled to the following fees, to-wit: For each certificate issued to persons engaged in the practice of dentistry in this Province at the time of the passage of this act the sum of ten dollars; for each certificate issued to persons not engaged in the practice of dentistry at the time of the passage of this act the sum of twenty-five dollars.

7. There shall be allowed and paid to each of the members of the said Board of Examiners such fees for attendance, in no case to exceed ten dollars per day, and such reasonable traveling expenses as the said board shall allow from time to time. Said expenses shall be paid out of the fees and penalties received by the said board under the provisions of this act.

8. All moneys in excess of necessary expenses shall be held by the secretary of said Board as a special fund for meeting the expenses of said board, he giving such bonds as the board may from time to time direct.

9. The said board at its first meeting, and from time to time thereafter, shall make such rules, regulations and by-laws, not inconsistent with the provisions of this act, as may be necessary for the proper and better guidance of the said board, which rules, regulations and by-laws shall first be published for one month in the *British Columbia Gazette*, and in one or more newspapers circulating in the Province. Any or all of such rules, regulations and by-laws shall be liable to be cancelled and annulled by an order of the Lieutenant-Governor in Council.

10. The secretary of said board shall on or before the fifteenth day of January in each and every year enclose to the Provincial Secretary an annual report of its proceedings, together with an account of all moneys received and disbursed by said Board of Examiners; also a list of the names of all persons to whom certificates have been granted and the qualifications therefor, and such lists shall be published in the *Gazette*.

11. If any person after a period of three months after the passage of this act, not holding a valid certificate, practices the said profession or calling of dentistry or dental surgery, or willfully and falsely pretends to hold a certificate under this act; or takes or uses any name, addition, or description implying that he is duly authorized to practice the profession or calling of dentistry or dental surgery, he shall upon a summary conviction thereof before any justice of the peace, for any and every such offense pay a penalty not exceeding one hundred dollars nor less than twenty-five dollars, and the half of any such penalty shall be paid to the Board of Examiners; and it is further provided that no person who is not qualified under the provisions of this act shall recover in any court of law for any work done or any materials used by him in the ordinary work of a dentist.

12. Any British subject being a resident of this Province (not entitled to the privileges and benefits of this act under section 1) desirous of entering the profession or calling of dentistry, shall be apprenticed to a practitioner duly qualified under this act for a period of three years, and shall file his articless of apprenticeship with the secretary within one calendar month after the said articles have been executed.

13. Any such person, being so apprenticed as aforesaid, shall, at the completion of the term of his apprenticeship, and upon the production to the secretary of satisfactory evidence of his having served his apprenticeship, and of his good moral character, be entitled to be examined as to his fitness to practice the profession or calling of dentistry before the Board of Examiners appointed under this act, and shall, upon passing such examination to the satisfaction of the said board, receive a certificate, upon the payment of a fee of ten dollars, which shall entitle him to all the rights and privileges of this act.

The Lieutenant-Governor has appointed T. J. Jones, L.D.S., of Victoria, Dr. P. R. Smith, of Nanaimo, and Dr. C. E. C. Brown as the Board of Examiners.

OBITUARY.

DR. FRANK P. ABBOT.

The many friends of Dr. Abbot received a severe blow in the announcement of his death, which took place in Blasewitz, near Dresden, Germany. He had been a sufferer for many years from an asthmatic trouble, but he bore this, as he bore everything, with so much fortitude that any serious result was not anticipated.

It is very difficult at times to be reconciled to the inevitable,—to feel that the old, old story of death has again to be gone over with its long separations, and the deeper agonies of those nearest and truest; but in this case there is the consolation that his life has been a benediction and his example one worthy of emulation.

It is too true that often the individual must wait the closing of the grave before the finer incentives that have actuated his life can be appreciated. This was not true of the subject of this sketch. He numbered his friends in many lands. In Germany, where he was best known, the time will be long before this life and its deeds will fade from the records of memory. This is the more remarkable when it is considered that Dr. Abbot never thrust himself prominently before the public or his profession. His contributions to dental literature were not extensive, nor did he actively enter into its discussions; but his interest in it was deep and lasting, and he was ever to be found at the front in active work.

He was born in Maine, and graduated at the Baltimore College of Dental Surgery in 1851, leaving shortly afterwards, the same year, for Berlin, thus becoming one of the pioneers of American dentistry in Europe. He drew into his professional life the teachings of Harris, and never in the long course of his extensive practice seemed to lose that influence. While active in interest in every new step that promised advancement, he was slow to adopt changes, preferring the old way. He seemed to the writer to be a remarkable combination of the liberal with a good share of conservative feeling in a professional sense. He was conscientious, and no one could help admiring his strong devotion to principle in refusing to be tempted to use materials which he might regard as objectionable. While he seemed thus to be opposed naturally to innovations, his courage was equal to any change that coincided with his judgment, though it might be in opposition to established rule. This was manifest in his faithful advocacy of tin and gold foils combined in one filling. He disclaimed any originality in this, but accepted it, and it was through his persistent effort that this has come to be recognized as a valuable addition to practice.

His life, however, is truly his best monument. He was respected and loved by all classes. His advice was sought for by both Americans and Germans. His home was an open one, and his receptions were always enjoyable and crowded occasions. Speaking several languages fluently, he entertained largely many nationalities. The writer was most impressed, in his intimacy with Dr. Abbot, with his power over individuals. There was nothing of the sycophant about him. He was true always to his American instinct, and yet few men can say to the same extent as he could that they were held not only in high estimation, but even enjoyed the affectionate regard of some of the highest in his adopted country. It was always a pleasure to the writer to hear the upper classes of Hanover—the nobility of the old *régime*—speak of Dr. Abbot. He had but to say to them professionally go, and they went. His recommendation was law to them, and by a proper use of this power he was always able to help, provided he was convinced of the worthiness of the subject. His advice was constantly in demand by young practitioners and rarely refused.

A remarkable trait was his ability to accommodate himself to circumstances. It was the privilege of the writer on one occasion to receive from him a lesson in contentment not very soon forgotten. He had suffered great losses financially in stocks after the French and German war of 1870. We were riding together through the environs of Paris. The conversation naturally turned on the beauty of the surroundings and the wealth required to produce these results. The writer ventured to express the deep regret that he felt for Dr. Abbot's serious losses, and that the labor of his lifetime had been so rudely scattered. Responding with a good deal of energy he said, "Don't sympathize with me; you should rather congratulate me, for it was the best thing that could have happened. I can now sleep well at night; have no trouble about stocks, and besides have received a good lesson."

While ever polite in his intercourse with his patients, he seemed to care very little for mere nobility. It is said of him that on one occasion he was called to the Royal palace at the command of the Empress. He waited long, and no Empress appearing, he collected his instruments and departed. This may seem a slight thing to the average American, but it was a very bold thing to do in the presence of royalty. Prince Albrecht, nephew of Emperor William, was always an attached patient of his. This prince held court in Hanover in the palace of the old King George. While operating for the prince on one occasion he asked him, as he laughingly informed the writer, "Why don't you come to me in the car or omnibus, instead of driving here in your carriage?" "That," replied the Prince,

"would be a convenient way, but then, you know, I would not be respected."

Dr. Abbot leaves a son to succeed him, who has recently graduated from the dental department of Harvard University. His son-in-law, Prof. Miller, has also been long connected with him, so that the practice he so faithfully labored to perfect is left in competent hands. He married the daughter of Hon. Theodore S. Fay, formerly Minister to Switzerland. His wife and two children survive him. Mr. Fay belonged to that brilliant circle of cultivated men of the past generation who were recognized as a power in the then political world. He resides with his family near Dresden. The daughter of such a man was well fitted to second Dr. Abbot in his social relations, and by her culture and conversational powers added greatly to the comfort of the many who frequented his hospitable home.

Upon the grave of this genial life—this open-hearted friend—the wreath of immortelles may justly be placed. In the presence of the mysteries of creation we are as children; in the presence of death we question the possibilities of an untried path. We linger on the memory of the good and true, and in this, the holiest of temples, we enshrine our friend. JAMES TRUMAN.

DR. W. W. CROSS.

DIED, in Brooklyn, N. Y., October 30, 1886, of paralysis, Dr. W. W. CROSS, in the fifty-seventh year of his age.

Dr. Cross was born in Bath, Me., in 1830, and graduated in dentistry. He came to Cuba twenty-eight years ago, and finally settled in Cienfuegos, on the southern part of the island, where he established a practice and made many friends.

Dr. Cross was a man of sterling qualities, and his loss will be much felt by his professional friends and acquaintances. Having had a paralytic stroke, he was sent to New York in October last, and died in Brooklyn on the 30th of that month.—A. C. BETANCOURT, *Cienfuegos, Cuba.*

BIBLIOGRAPHICAL.

THE PHYSICIAN'S VISITING LIST (Lindsay & Blakiston's) for 1887. Thirty-sixth year. Philadelphia: P. Blakiston, Son & Co.

We are again favored with a copy of this excellent little annual, which contains, besides the calendar and blanks for yearly visiting list, much useful and ready information for the practicing physician, such as tables of signs, poisons and antidotes, the metric system of weights and measures, dose table, notes on disinfectants, examination of urine, new remedies, etc. The price varies from one dollar to three dollars, according to size, etc.

PUBLISHER'S NOTICE.

THE DENTAL COSMOS FOR 1887.

The growth and excellence of periodical literature is one of the most marked characteristics of our times. In every field of thought, every department of effort, it has become a recognized necessity—the best means of development. Especially is this true in all scientific and professional pursuits; in none, however, more emphatically than in dentistry. No other field has been more enlarged or better explored, and no other presents to-day a more inviting prospect.

If, therefore, a periodical literature is essential in any calling it is in that of dentistry. The ceaseless progress of discovery; the practical suggestions of experience; the new methods devised by minds devoted to special lines; the sifting of theories, and the corrective exposure of crudities by criticism,—these demand a periodical publication. All who are on the lookout for fresh and practical suggestions, available in daily practice, have long since learned better than to rely upon their text-books and their notes of lectures listened to in their student days.

It is not safe for any earnest worker to miss a single number of the Dental Cosmos, lest a valuable fact or suggestion should be lost, to the detriment of some patient to whom better service might have been rendered as a result of its perusal.

There are fields as yet almost wholly untilled as inviting and as promising as those which have been more thoroughly explored, and the coming year promises to be more rich in development than any preceding year. We propose to keep abreast of the times, and to make the Dental Cosmos for 1887 no whit less valuable than heretofore, and we are willing that the future shall be judged of by the past.

THE S. S. WHITE DENTAL MFG. CO.

PERISCOPE.

Exsection of Second Branch of Fifth Nerve at Foramen Rotundum.—The patient was a lady from Oregon, suffering with neuralgia of several years' standing affecting the superior maxillary division of trifacial nerve. Remedies of every nature having been tried at the hands of some twenty different physicians, and several minor operations done at different Western hospitals, and the suffering having increased to such extent as to render it no longer endurable, the operation of excision of the nerve-trunk was proposed and gladly accepted.

On September 11 the patient was etherized and exposure was made of the anterior face of the antrum, the infraorbital nerve being dissected from the flap and caught by a bull-dog forceps. The immediately succeeding step removed the boundary of the sinus, the surgical engine being used, while the bur, directed by the line of the nerve, quickly cut away the floor of the canal, and so permitted the branch to fall into the antrum.

Following this was the task of reaching the nerve, as it rests upon the floor of the orbit. Great care being exercised to clear the cavity of the sinus from clots of blood with which it too quickly filled, and a raspatory being used to scrape a line upon the antral roof, a dull bur was put in the place of the sharp one heretofore used, and the marked and rasped space was cut away to an extent which exposed nerve and eye-appendages. Here delay was made to show to the class at large the exposed nerve as it lay, white and shining, in the opened antrum, and could be moved about in all directions.

The final step of the operation—namely, entering the spheno-maxillary fissure—required the greatest attention and caution. The bur used was conical as to shape, fine and short as to blades, and was revolved to the extent of the power of the engine, some fifteen thousand revolutions to the minute. It being shown to the audience that absolute steadiness had been secured by means of the velocity, the antrum was again cleared of blood-clots and its posterior face made to define itself clearly in the sunlight. All being prepared in accordance with the mind and requirements of the operator, the bur was reintroduced into the cavity, and in a single moment the fissure was opened.

To insure the proper completion of so delicate and complicated a performance, the nerve was isolated and the round foramen defined by means of a delicate fenestrated probe, which, guided by the nerve it encircled, was pushed inward and upward until it struck the base of the skull. The nerve-trunk was then cut by means of a tenotome or fine curved bistoury.

This operation, perhaps one of the most delicate and least frequently attempted performances in surgery, has been thrice shown within a short time to his students by Professor Garretson.

On the third day after the operation a visit to the hospital showed the patient sitting up in a steamer-chair, chatting comfortably with her nurse. The union of the external wound was already and perfectly accomplished by first intention. At the date of this writing, still three days later, a sponge, with which the eye was being in-

sured against any possibility of prolapse, had not been removed.—*Clinic of Prof. Garretson, Hospital of Oral Surgery, in Philadelphia Med. Times.*

The above operation was repeated in the presence of an assemblage of at least three hundred persons, in the case of a gentleman, on Saturday, November 6. The subject of the previous performance found herself able to leave the hospital at the beginning of the third week, free of pain entirely. The antiphlogistic used, as with all operations done by Prof. Garretson, was Phénol Sodique.—[Ed.

Section of Superior Maxilla in Treatment of Neuralgia.—The subject in this case was from Bermuda,—a lady, a private patient of Professor Garretson's, about 60 years of age. The neuralgia was persistent and severe, and of some twelve years' standing. Diagnosis as to position was arrived at through the process of exclusion. The seat of lesion was determined to be on the line of relation of the posterior and anterior dental nerves, where these lie at the base of the antrum.

The operation was performed by means of a circular saw, the lip and cheek being held out of the way and protected by means of retractors; the object being to remove all that portion of bone bounded in front by the symphysis, at the back by the tuberosity, above by the floor of the sinus, and below by the free ridge of the gum. This locality was mapped out by means of incisions reaching through the overlying soft parts to the bone. Following the incisions, and occupying the lines of the cuts, came the saw. It required scarcely an appreciable period of time for the operator to show the section in his hand to the class. The relief from pain was decided and immediate. At the present date the case is advancing to a most satisfactory cure.

Nine minor cases were then shown and treated.—*Clinic of Prof. Garretson, Hospital of Oral Surgery, in Phila. Med. Times.*

Secondary Inflammation of the Parotid.—In the *Lancet*, April, 1886, p. 732, Mr. Stephen Paget brings forward sixty cases of parotitis of secondary origin; the primary lesion being in the abdomen or pelvis. Most of the patients recovered, and in many the absence of all signs of pyemia or septicemia was especially noted. From these cases the author concludes:

1. That the parotid gland is related to the peritoneum.
2. That it is also related to the generative organs.
3. That an abdominal or pelvic lesion may be followed by parotitis without pyemia.
4. That such a parotitis, if it occur late, and with healthy kidney, is usually followed by recovery.

Among the cases noted, the parotitis followed the use of a catheter or sound in four instances. Several cases followed delivery, or induced abortion, and peritonitis either from injury or from perforation. After operations such as gastrotomy, enterotomy, and especially after ovariotomy, the occurrence of parotitis is not at all unusual. In cases of pelvic cellulitis and pelvic abscess, and in operations on the cervix uteri, it must be always kept in mind that parotitis

sometimes occurs. One case is reported of a lady who had enlargement of the parotid during six successive pregnancies; and one case of amenorrhea is also mentioned in which the patient had parotitis at the menstrual periods.—*Cincinnati Lancet-Clinic.*

Sore Mouth of Infants.—This is often due to the rough and careless swabbing out of the mouth of the child by the nurse, who uses the corner of a coarse towel, and proceeds as if she were scrubbing the kitchen floor or back stairs. In Prague, since Obstein has forbidden the washing of the mouths of infants born under his care, stomatitis has almost disappeared from the lying-in, whereas previously fifty-two per cent. of the infants born there, and under ten days old, were afflicted.—*Med. and Surg. Reporter.*

HINTS AND QUERIES.

To the Editor of the Dental Cosmos:

In the name of those operators who have used, are using, and still hope to use bars and bridges to a reasonable extent in their practice, let me protest against the abuse of those devices. When we have one soberly advising the use of a bar in the back of the mouth carrying three or four teeth, and supported at the anterior end only, and when one of the fathers of the profession declares before the American Dental Association that "if there is a tissue that will bear almost unlimited abuse it is the pericementum," I think it time to cry a halt.

In the September number of the Dental Cosmos, page 598, we have a case in point. Let me try to describe how I should do such a case. In Fig. 1 we have the first bicuspid standing; the second bicuspid and cuspid in that case filling the rôle of the lateral, missing from its position. The bicuspid is pear-shaped, its largest diameter being just below the grinding surface, and the molar is a trifle undercut. A No. 7 or 8 English gauge gold plate, struck from a model made from a modeling compound impression, would not touch the necks of either the bicuspid or molar, owing to the fact that these teeth would "draw" a little in the impression, and it should be fitted over the shoulder at the neck on the lingual side of the cuspid, left clear of it at the distal side, and have a stay or clip resting just above the prominence on that side of the tooth. A band should be soldered to the plate at the lingual side of the bicuspid, to grasp that tooth at its largest point, viz., about one-third of the distance from the grinding surface to the neck; also, a band fitted to the molar to reach from about the middle of the lingual side far enough around the mesial face to clasp over the prominence at the mesio-buccal aspect of the tooth; this band to be fitted to grasp the tooth at its fullest part, as in the case of the bicuspid. (See Fig. 2.) Wires or clasps at the necks of teeth of this class do no end of damage to the teeth, and are open to the great objection that a case may go in never so hard, and yet when the clasps are past the large part of the teeth the case is quite loose and shaky. The bands I have described do not bear on the teeth at all until the case is within about a line of its place, and then each one bears on its own tooth irrespective of the others, and, be it borne in mind, touches the tooth at a point where the chance of decay is simply infinitesimal. If a porcelain cuspid and bicuspid be ground in properly, the clasps will not be visible externally, which cannot be said of the broad gold band carried across the buccal face of the natural tooth in the bar case quoted.

A case made as I describe is durable and firm under mastication, and occupies very little space in the mouth, and no watch-keys or monkey-wrenches are needed to insert or remove it. It will be noticed that there are no stays on the bar case alluded to to prevent its rotating on the bicuspid as a center, and I would call attention to the fact that the inevitable consequence of a tight collar on a tooth so tapering would be that it would travel towards the root under mastication on the two artificial crowns, and, as it could not work back from a smaller to a larger section of

Fig. 1.

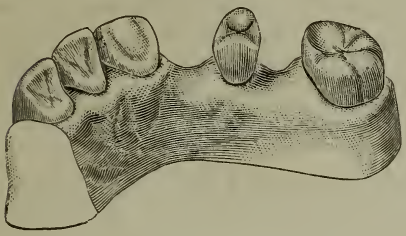
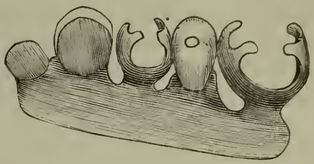


Fig. 2.



the cone, the elasticity of the gum under these crowns must tend to lift the natural tooth from the socket a hair's-breadth. The reinsertion of the case after cleaning and the consequent tightening of the set screw could have but one end in time, the gradual lifting of the tooth from its socket. The result would be in a way, though slower, almost identical to the putting of a rubber ring around a tapering tooth.

A gold plate for such a case need not be over five-eighths of an inch in width, and could be made for a fee remunerative to the operator and satisfactory to the patient. I firmly believe that if the same ingenuity and skill now brought to bear on bridge-work were used in the insertion of partial gold cases, it would in the long run be better for both the profession and the public. I think that there are limits, and well-defined ones, too, to the abuse of that same pericementum.—Charles Rathbun, London.

Fig. 1.

Fig. 2.

Fig. 3.

Younger's Operation.—Few of us are so fortunate as to invent a new surgical operation. This Dr. Younger has done, and the invention is valuable. That it should not always succeed is to be expected. What one of our ordinary operations does? Certainly not the commonest one of filling teeth.

In the dental journals few records of this operation having been performed by others save the inventor can be found. The operation is so simple, however, that it is wonderful it has not received more attention from the profession.

In doing the work the chief objection is the long time which it takes. I am certain that, with the instruments I am about to describe, the time need not exceed five minutes, for my first case took only seven minutes. There are three instruments in this set, and there should be several sizes of each form.

The first instrument is a medium size of one of my tubular knives, Fig. 1. With this the soft tissues are cut to the bone, requiring about five seconds. For the incisors

and cuspids, the hole this makes corresponds fairly with the shape of the tooth at the neck. For the bicuspids, which have a more or less oblong shape on cross-section, this round hole would, apparently, not be of the correct shape. It is only necessary, however, to have a tubular knife which measures a little less in circumference than the tooth at its neck to insure a perfect fit, for the soft tissues are elastic enough to conform to the tooth if the hole is large enough.

The second instrument is a spiral knife with two blades, Fig. 2. This is pressed against the bone and pushed in to the shoulder, which should be adjusted to the proper position. This instrument cuts the bone with great rapidity and without any special pain.

The third instrument is a similar knife, only more conical, Fig. 3. This is pressed into the hole previously made, and then swayed to enlarge the cavity to fit the root. It will not be necessary to use this but twice, as the eye carries the shape of the root with enough accuracy to enable one to get the hole of almost the right shape the first time.—William Herbert Rollins.

Dental Science—Dr. L. C. Ingersoll's "Questions and Answers."—Feeling sure that no intentional misrepresentation is allowed to appear in the Dental Cosmos, I ask permission to correct one or two misapprehensions, which I observe in the notice of Dr. Ingersoll's recently published volume, in the October number.

The writer of the review complains that the author does not mention oil of cloves as a local anesthetic and its use in pulp-exposure in the answer to the question, "What are its effects?" The answer is, "A prompt and active stimulant and astringent." But that the author was not unaware of its anesthetic or obtundent properties is manifest two or three lines further on, where it is specifically recommended "to quiet the pain of an exposed pulp," and said to be "peculiarly adapted to children's teeth." Again, a few lines further along, he recommends it in combination with creasote as "one of the most valuable pain-obtundents in use for cases of exposed pulp."

The reviewer also finds no mention of aconite in the direct answer as to the treatment of acute inflammations of the root-membrane. But in a foot-note, to which the reader is directed by an asterisk at the close of the answer, is an explanation of the omission, while elsewhere in at least two places the applications of aconite are given.

The object of the author seems to have been to separate as much as possible materia medica from therapeutics, placing therapeutics in more immediate connection with pathology, where in my judgment it more properly belongs. Thus, while oil of cloves is a stimulant and astringent, its therapeutic effects are those of a pain-obtundent. And is it not true that many, if not most, pain-obtundents produce their obtunding effects from their stimulating properties?

The misapprehensions, therefore, to which I have alluded are in the failure to have grasped the plan of the work. Whether Dr. Ingersoll is correct or not I do not propose to discuss, but the subject is an interesting study, and "the question is before the meeting."—S. M. E.

The Bleached Skeletons of Kauai.—This summer my usual outing with my family was spent in a beautiful valley on the island of Kauai, surrounded on three sides by mountains from two to four thousand feet in height, and only open to the sea. Through this valley, about a mile long and half a mile wide, at varying distances from the sea, there are grassy knolls and hills, evidently made by the ever-blowing trade-winds, which have piled up the sands from the seashore

and left little gorges between. In these shifting sand-hills have been buried, from time beyond history or tradition, the former numerous occupants of this fruitful valley, the many warriors that from time to time have attempted to wrest it from its possessors, and who have been slain in battle, and the bodies of those who in the olden time (when canoes were the only means of transport) were capsized and drowned in these high-rolling breakers. An old native residing here informs me, too, that it was the custom of those old savages, when the inhabitants of other valleys or more distant islands drifted there looking for help, to murder the people and thrust their bodies into the sand, and to seize their canoes and other valuables. From all these sources great numbers of bodies have been deposited there in a small space. The sand, like snow, is constantly shifting, thus exposing great numbers of skeletons of a pre-historic race, which the sun and rains have bleached to perfect whiteness. Among these, for the past few weeks, I have wandered, trying to gather from them lessons that would be useful to myself and others.

While as a dentist I was naturally most interested in the skulls, I constantly observed that all the bones were large, dense, and well formed, and many of the skeletons of great size. I have seen but two bones that had been broken and healed, and those were arms. Many of the skulls that have but recently been uncovered have all the most delicate bones in place and uninjured, so that they tell the whole and full history of their dental sufferings, if they had any, even better than though they were clothed in flesh and sat in my dental chair. Many writers would have us believe that, among this hardy people, with the finest physiques known to any race; living on the simplest food and the best calculated to develop the strongest and best of bones and teeth, we should find nothing but perfection in the dental arches. I fear that I shall hardly be credited when I say that among all the skeletons, where I have found both superior and inferior maxillaries, none have had complete dentures. This does not take into account the loss of anterior lower, and less frequently upper teeth, which were knocked out to express their grief at the death of a favorite chief, as was their universal custom in those times. Some had lost but one or two teeth; others the greater portion of the molars, while not infrequently the anteriors showed decay upon their surfaces, or had left the traces of alveolar abscess.

In several cases I saw traces of great suffering, caused by the eruption of the inferior third molars, and in several by the superior. I have one specimen that shows the ravages of salivary calculi, but as a general thing there was but little upon the teeth. I have seen no instances of erosion, but many of the teeth are much worn by use, and are as highly polished as they were the day their owners died.

One specimen I found had anchylosis of the left side of the jaw. Several had exostosis. The effects of alveolar abscess were very frequently seen, sometimes leaving but a small opening through the outer plate of the jaw, while within the cellular portion would be cut out to considerable extent. Then, again, the whole outer plate as well as the cellular portion would be gone. I found in one or two cases what I thought to be traces of pyorrhea alveolaris.

I found the antrum of Highmore varying greatly in the different skulls, sometimes occupying but a small place back of the first molar, and sometimes extending to the first bicuspid. The elevation caused by the roots of the molars was generally covered by a thin plate of bone, but in a few instances the roots were fully exposed.

While I found a few instances of remarkable irregularity, on the whole the teeth were symmetrically set, the arches broad, and each tooth knuckled to its fellow

in true model style, touching closely at a single point,—the thickest portion of the enamel.

I was much interested in uncovering two skeletons lying side by side, both females, one much older than the other, in which the peculiar dental irregularity if the older was exactly repeated in the other. It may have been a curious coincidence, but I suspected they were a mother and daughter.

The regular mode of burial was to draw the knees to the chin, throw the arms about them, and tie all together as closely as possible, giving the body a sitting or reclining position.—J. M. WHITNEY, M.D., D.D.S., Honolulu, H. I.

THE HERBST OBTUNDENT.—In response to an inquiry, Dr. C. F. W. Bödecker furnishes the following formula.—[ED.

"Sulphuric ether and sulphuric acid, when mixed, form a definite chemical compound, in its nature entirely different from either. To make the Herbst obtundent, take a half drachm of of c. p. sulphuric acid, and add as much hydrochlorate of cocaïne as the acid will dissolve; then add, little by little, about one and a half drachms of sulphuric ether, while the fluid is constantly stirred with a glass rod. The point of super-saturation is indicated by free ether remaining on the surface of the liquid."

MORE ANOMALIES.—Reading in the June number of the DENTAL COSMOS the description of various dental anomalies, induced me to look over *my* curiosities. I found the following: An upper molar with six roots, three of which branch off from the crown and are separate; the other three being well defined in contour, but not separate, except at the apex of the roots. I extracted a cuspid from a dwarf. He came back the same day and said there was a root still remaining. Upon examination I found an imperfectly-formed tooth, three-eighths of an inch long and one-eighth of an inch in diameter. A day or two afterwards he handed me another, which he said he had just fished out, one-fourth of an inch long and about half the diameter. Also a second and third upper molar, the apex of the second being lost in the center of the third.—E. W. MURLLESS, Weeping Water, Neb.

DR. E. PARMLY BROWN'S SYSTEM OF CROWN AND BRIDGE-WORK.—Dr. Brown furnishes the following correction:

"Fig. 5, page 584, in the September number of the DENTAL COSMOS, is incorrect in two respects. The palatine aspect of the completed bicuspid should be a curved line from the palatine cusp to the cervico-labial portion, and not make a saddle over the ridge, as shown in the cut, which would be non-cleansible. The other cut, with a bar riveted on to a bicuspid, should have the bar placed in a groove ground into the center of the tooth; riveting being done to incisors and cuspids only."

DRY MOUTH.—An elderly lady, who is wearing a complete maroon vulcanite denture, exhibits symptoms as follows: The mouth is hot and dry, with no perceptible flow of saliva; tongue hard, dry, in color like raw beef, and cleaves to the roof of the mouth. A white, curd-like mucus is constantly present in the mouth. The roof of the mouth is so hot that in order to take an impression in plaster it was necessary first to oil the whole surface; otherwise the plaster could not be removed unbroken. There are no general fibrile symptoms, but severe pain in the back of the head, which is very hot.

The patient has in vain sought relief from physicians, and now turns to her dentist for advice. Has any reader of the DENTAL COSMOS a suggestion to offer? —F. F. GAGE, Boston, Mass.